Home Computing WEEKLY

An Argus Specialist Publication

No. 29
Sept 20-26, 1983

38p

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SOFTWARE REVIEWS FOR:
Spectrum, BBC, TI-99/4A, Dragon, Oric, Commodore 64, Atari

GAMES TO TYPE IN FOR:
Spectrum, TI-99A/4A, Commodore 64, Dragon, Oric

PROGRAMMING ADVICE FOR:
Commodore 64, VIC-20, Dragon, Oric, ZX81, TI-99/4A

'Improved' Spectrum couses software problems

In an attempt to solve two long standing problems with the Spectrum's graphics, Sinclair has created a new headache for some software houses

The latest Series 3 Spectrums produced over the last six to eight weeks, contain a new ULA (uncommitted logic array) chip The new chip is intended to improve the quality of the Spectrum's colour graphics display and to ensure that it is now compatible with all makes of TV set

But according to Mary Reinmen, of Sinclair Research, the new chip has had "unforeseen side effects"

Continued on page 3

• • •

Parents: 'You're to blome'

Parents are to blame for girls falling behind in computing, according to Acorn's boss

He was commenting on his company's research, plus a survey — first reported in Home Computing Weekly — showing boys are 13 times more likely than girls to use micros at home

Chris Curry, Acorn's joint managing director, said "Many teachers in our survey pointed out how many more boys than girls use micros at home

Continued on page 5

"robustness and reliability were excellent... a really good feel to the action... a pleasure to use... not one game failed to load... nice professional ... I like it... very impressed"

EXTRACTS: J.O COLLINS
GIANT TEST VIC COMPUTING
(Vol 2 Issue 5 June. 83)

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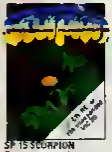

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Continued from front page

"It has affected some software, though none of our own programs or those from our major suppliers," she said

Specifically, it appears that the new chip has affected the IN function, used to monitor input ports, when the Spectrum is in graphics mode.

It means that some programs, like Buttercraft's Power Graphics, written for the old series of Spectrums, won't work properly on the new ones

But Sinclair has no plans to modify future Spectrums Mary Reinman said "Rather than seeing Spectrums as being affected, they are to our minds improved It took a long time to develop the new ULA chip, and changing it again is not something we intend to do It's really a software problem, and changes will have to be made by the software companies

"The function affected is one that software companies have discovered for themselves — it wasn't in the Spectrum's manual or in the specifications We didn't say it would be unchanged for ever and ever

So far, the number of programs affected by the new chip seems to be small John Rowland, computer buying manager at W H Smith, said "to date, we have not received any customer complaints, though following this report we will be conducting a full investigation."

And Paul Cooper, software manager at Quicksilva, said "I'm not keen on the screen display on the Series 3 machines, because it's shifted to the left by about two characters But so far the only actual problem we've come across is with one of the new machines breaking on us"

• • •

Stand up your computer

Shinecraft's new computer work station has space for your micro, TV, cassette recorder and programs

And it's on castors so that you can just roll it discreetly out of the way if your family starts to complain that the micro is taking over Price £60.

Shinecrest, 5 The Spinney, Hertford, Herts SG13 7JR

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Program that Dragon — page 14

Into space with your Commodore 64 — page 27

Colourful cassette inlays to cut out and keep—pages 15 and 16

What's the connection between this man and the Space Shuttle? Find out on page 40

Professional Software for Spectrum and ZX81

SPECTRUM 48K

■ **Payroll** Weekly monthly hourly All tax codes and pay levels Guaranteed correct £25 00 ■ **Statutory Sick Pay** Better than programs costing 10 times as much on other machines £40 25 ■ **Stock Control** Over 1500 lines Find and delete in 2 seconds Sinclair or full width plain paper printer with interface supported £25 00 ■ **Spectrum Demo Tape** Demonstration versions of payroll stock control SSP On one tape £5 95 ■ **Critical Path Analysis** Enter network of over 500 activities Program finds critical path Durations and costs can be modified and the calculation repeated Full width printer supported £15 00

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■ **Mortgage** Search repayment amount affects duration and total amount paid While paying see how much interest and how much capital you are paying Month by month table printed On the same tape ■ **Loan** Calculates total interest when paying instalments etc £5 00 both programs together

Parallel Printer Interfaces

■ **The Standard Interface** Centronics interface to link your ZX Spectrum to many popular dot matrix and daisywheel printers The package includes interface simple word processor 3 sets (different) of printer software cable cent ronics plug full instructions The **LLIST** and **LPRINT** commands are supported Many other features also £45 inc VAT Post free ■ **The Deluxe Interface** Includes all the features of the standard package and also has a 3 5 mm jack socket and special memory which allows the ZX Spectrum to **Save** and **Load**, without having tampering or switch anything £55 inc VAT Post Free ■ **The Professional Interface** Includes all the features of the deluxe package but also allows the ZX Spectrum to be used as a very powerful peripheral processor for a bigger computer Software is supplied which post processes word processor output with straight right and left margins £99 inc VAT Post free

Tape Loading Problems With Your Computer?

■ **Loading Aid.** Allows you to get tape playback level right first time Helps with dropouts and to check tape quality too! Standard model £5 95 De luxe model £7 95 ■ **The Microcomputer User s Book of Tape Recording** Is a practical guide to help you get programs in and out of your computer Written for the computer user but several audio and computer professionals have found it useful 16BN 0 946476 00 4 ONLY £3 15 incl postage (£2 50 in shops – temporarily out of stock) ■ **Test and Alignment Cassette:** Tape loading problems are often due to a misaligned tape head Align your tape head by ear with our tape – no instruments required! £4 90

ZX81 16K

■ **Beamscan** Computes bending moment and shear force diagrams for a simply supported beam with 1 in point uniform and uniformly tapered loads £25 00 ■ **Time Ledger** For up to 17 employees 200 clients £15 00 ■ **Optimax** A powerful linear optimisation program up to 75 variables constraints £40 00 ■ **Payroll** As above but only up to 30 employees £25 00 ■ **Stock Control** As above but 400 stock lines in 16K or 2000 lines in 64K £25 00 ■ **Critical Path Analysis** Up to 500 activities in 16K Over 500 lines in 48k £15 00 ■ **Budget:** Keeps track of expenses and compares with budget 50 headings plus 12 months or 12 categories £15 00 ■ **Financial Pack:** Contains three programs Mortgage Loan and VAT £8 00

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THE WIZARD S WARRIORS A fast moving game that matches developments in your skill as a player by becoming increasingly more devious By offering to you the full range of options you can choose how to control your warrior through the maze A full implementation of this program enables such features as a continuous series of sound effects, arcade quality graphics, double point scoring and–for the very artful –bonus lives. **Spectrum £4.95**

FORTH A full implementation Ideal for writing fast moving arcade type games Allows the full colour and sound facilities of the Spectrum to be used Future Microdrive enhancements will be made available **Spectrum 14.95**

ADVENTURE ONE Features a save game routine as the game can take months to complete
'a remarkably good version well worth the money' *Sinclair User* **ZX81 £5.95**

MAZEMAN A fast action m/c game that reproduces the spirit of the original
'is very accurate and fast' *Which Micro?* **Spectrum £4.95 ZX81 £4.45**

CHESS 1 4 Ten levels of play with this m/c program Good graphic screen display
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INVADERS Very fast m/c action Includes mystery ship and increasingly difficult screens **ZX81 £4.45**

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Continued from front page

"This has two effects First, boys get ahead of girls in computer studies Indeed, the evidence shows that for young teenagers, boys are probably spending more time on computer studies at home than they are at school

"Second, as the boys race ahead, the girls lose both interest and confidence — a situation aggravated by the relatively small number of machines so far in schools

"Britain is in danger of losing half its talent if girls don't acquire vital computer skills

"It is clear that much of the problem is due to parents giving home computers to their sons rather than to their daughters

"This 'leg up' for boys means that girls are neither able to compete with their more knowledgeable brothers in school, nor in the even fewer jobs outside "

Some teachers, said Acorn, were so worried that they were starting girls-only computer courses

A spokesman said the latest research had given added emphasis to an article in the July 26 issue of Home Computing Weekly, headed "Girls — micros are for you, as well "

Our article in HCW 21 — now concern is growing

Autumn crop of cartridge games

When you ve seen the film and read the book, you can play the game

We've told you about Wargames, the new film about a boy computer genius who accidentally triggers off the count down to a nuclear war Now Thorn EMI has announced Computer War, a cartridge game based on the film, in which the player's task is to prevent total destruction of the planet.

It'll be available from Thorn EMI dealers in September for the Atari 400 and 800 at just under £30 and for the VIC 20 at just under £20

Other games cartridges out this month are Major League Hockey for the Atari 400 and 800, at just under £25, and Medieval Joust for the VIC 20, at around £20

Lagging behind the rest, but expected by October, three of Thorn's games will also be available for the TI-99/4A Computer War and Submarine Commander, priced at around £30, and River Rescue, at around £25

Thorn EMI, Upper Saint Martin's Lane, London WC2H 9ED

A million tests later . . .

Software company Sumlock has moved into add-ons too with a £12 95 joystick with switches claimed to have been tested with a million simulated operations

The Pro Ace, with a 4½ft cable, is for the VIC 20, Commodore 64 and Atari computers and video games machines and will be on sale next month

Later models will fit the BBC, Dragon, Spectrum and Oric

The joystick, guaranteed for two years, has two fire buttons — one on the top and one at the front

Sumlock, Royal London House, 198 Deansgate, Manchester M3 3NE

Winners by 100 legs

Two young arcade game players are off to Munich to compete in the International Final of the Atari Player of the Year Competition

In the National Final, held in London on 20 August, contenants had to try their hand at Ataris Centipede cartridge Stuart Murrey, aged 14, won the under 18 event with a score of 221,983

The over-eighteen event was won by 19-year old Andrew Brzezinski, with a score of 197,710

Over 80,000 people originally entered the competition in local Atari stockists If the two national winners manage to beat the opposition in Munich, they win an expenses-paid trip for two to the 1984 Olympic Games in Los Angeles

Briefly

RAMwise is the name A&F Software has coined for its programs which will fill the available RAM — including add-ons — and then auto-run It means that computers with extra memory can run the more sophisticated programs A&F began with software for the Atom and is launching six Atom titles, priced at £5 75-£6 90, in time for Christmas A&F's range now covers computers like the Spectrum and BBC

A&F Software, 830 Hyde Road, Manchester M18 7JD

□ □ □

Sinclair Research has brought out five new tapes for the Spectrum and one for the ZX81, ranging in price from £4 95 to £12 95 For the Spectrum Monitor and Disassembler, Zeus Assembler, The Cattell IQ Test, a squares puzzle called Flippit, and a Grand Prix game named Chequered Flag Mothership is a space adventure for the ZX81 with 16K of RAM

Sinclair Research Stanhope Road, Camberley, Surrey

□ □ □

Pinball Wizard, an American import for the unexpanded VIC 20, is claimed to give many of the features of a real pinball table, including nudge Price £7 95

Terminal Software, 28 Church Lane, Prestwich, Manchester M25 5AJ

You could be on our pages

We welcome programs articles and tips from our readers.

PROGRAMS should, if possible, be computer printed to a width of 48 charatters (use a new ribbon) and/or sent on cassette. Check carefully that they are bug-free. Include details of what your program does, how it works, variables you have used and hints on conversion.

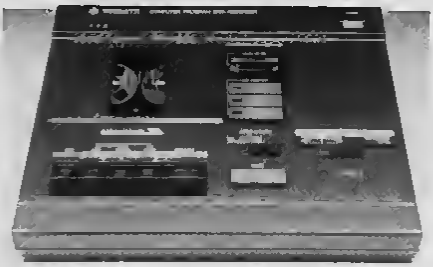
ARTICLES on using home computers should be no longer than 2,000 words. Don't worry about your writing ability — just try to keep to the style in HCW. Articles most likely to be published will help our readers make better use of their micros by giving useful ideas, possibly with programming examples. We will convert any sketched illustrations into finished artwork.

TIPS are short articles, and brief programming routines which we can put together with others. Your hints can aid other computer users.

Competitive rates are paid.

Keep a copy of your submissions and include an SAE if you want them returned. Label everything clearly and give a daytime and home phone number if you can.

Paul Liptrot, Home Computing Weekly, 145 Charing Cross Road, London WC2H 0ER



The CPD 8300 computer cassette recorder from Smiths — a new look and more features

New-look recorder

W H Smith has launched a new own brand computer compatible cassette recorder, which should be in their branches within the next couple of weeks

The new recorder is called the CPD 8300, and is said to operate reliably with any personal computer that loads and saves programs using standard microphone and earphone sockets

The CPD 8300 has all the features of Smiths original computer cassette recorder, but has been redesigned to give better visibility. It has a three digit tape counter and a cue/review facility

It also features an electronic pause which can be overridden by computer control, using the remote motor control socket This also means that you can use the recorder while the Remote connection is still plugged in

Both Save and Load levels are adjustable, and there are two Save input sockets to cater for computers with Save signals of different levels The signal level indication meter lights up for easier viewing

The recording/playback head has also been designed to be easily adjustable

Price £39 95

W H Smith, 10 New Fetter Lane, London EC4A 1AD

Dragon takes flight

Dragon owners can fly through the air with the greatest of ease with the Dragonfly Flight Simulator from Hewson.

But Dragonfly should not be confused with Hewson's Night Flight program for the Spectrum. According to Gordon Hewson "Dragonfly is written by a completely different person, who flies as a hobby — it's not a conversion from Night Flight

"Because of the Dragon's limited graphics, some of the instruments you find in the Spectrum program are missing, and information like the bearing has to be given in figures

"But there are two runways on Dragonfly, and you can do things like loop the loop and barrel rolls."

You take off from Norwich Airport and fly a circuit landing at their either Hethel or back at Norwick, depending on how much of a challenge you want At Hethel, there are no runway lights, and you have to make your landing with the aid of a radio beacon

Dragonfly can be played with a joystick and costs £6 95

Hewson, 60a St Mary's Street, Wallingford, Oxon OX10 0EL

Ian makes a Splat . . .

Software writer Ian Andrew, 24, is bringing out his first game under his own label

Mr Andrew, who wrote Mind-Out for Quicksilva, is now the managing director of Reading-based Incentive Software — and his mother, Barbara, is the company secretary

For the last four-and-a-half years he has been selling collectors' postcards by mail order and it is the profits from this that are being used to launch Incentive

The new company's first cassette is Splat, a £5 50 game for the 48K Spectrum due out in about a fortnight Mr Andrew said he and 18-year-old Ian Morgan wrote it over six months It featured a £500 prize for the best score by January

Mr Andrew said "I've got several ideas in the pipeline I'll have to see how Splat goes I thought it would be a bit of a challenge to compete with the big boys." He would continuing writing for Quicksilva

Incentive Software, 54 London Street, Reading, Berks RG1 4SQ

If music be the food of micros . . .

The British home micro industry has reached an impasse it cannot go much further in its present direction without stagnating Furthermore, for the first time it now faces serious competition from Japan with the arrival of the Sord M5

So is this new jewel in the crown of British industry finally to go the way of so much of manufacturing industry recently? Is it to suffer the same indignities as cars, motorcycles and cameras at the hands of the ruthlessly efficient Japanese export machine?

For several reasons the answer is probably no — at least, not for a long time For one thing, the home micro industry enjoys a degree of government collaboration that the rest of manufacturing industry does not

British micro makers also have an advantage in components the Americans and Japanese may lead in big RAMs and processors, but the UK is widely renowned for low volume custom-made chips

There is also, I believe, a more subtle reason why our micro industry will survive — one related to innovation

Consider the car industry The innovations on new cars tend to be limited and cautious, the approach is evolutionary rather than radical Competition between companies is on the basis of cost which usually depends on production management

Contrast this with a computer program which requires virtually no production management but consists, as nearly as anything can, of pure ideas

Most manufactured objects fall somewhere between these two extremes, but if we imagine a scale with cars at one end and programs at the other then micro computers will tend to fall nearer to programs than they do to cars

The fact that the Japanese are very successful at making cars and the British very successful at producing good software therefore promises well for the micro industry

There is however a critical difference between having a talent for innovation and applying it in the right place, and recently the market has grown a little stale

New models tend to look very much like old models, and you could be forgiven for thinking that the only reason the micro was invented was to play games that have changed remarkably little since Space Invaders

One innovation likely to catch on is the Microdrive and its partner the Interface 1 With the competition nowhere in sight, it is likely that interfaces to connect the Microdrive to other micros will be made Nevertheless the Microdrive is a device more likely to consolidate old markets than create new ones

Ironically, it is the M5 itself with its "mini synthesizer" that clearly indicates one way forward

I am constantly astonished that a country like ours, with such an enormously successful music industry and where Yamaha sell thousands of organs every year, should produce home computers on which the music facilities are invariably poor, derisory or non-existent.

Manufacturers naturally want to keep the cost of the basic unit down, but there is also a general lack of musical add-ons Music could well provide a growth area that is as large as the whole industry is at present With the increased popularity of standard interfaces a potentially fast growth area

British micro manufacturers have made a huge impact both at home and abroad With a little imagination and making full use of their advantages they are ideally placed to sound off the Invaders

S.J. McQuillen
Freelance Writer
Kinmel Bay,
Rhyl

● **This space is for you to sound off about the micro scene, to present bouquets or to hurl brickbats Share your views by sending them to Paul Liptrot, Opinion, Home Computing Weekly, 145 Charing Cross Road, London WC2H 0EE Please include your occupation and your interest in computing**

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Here's a selection of bright ideas sent in by our readers. If you've made a discovery about your micro, why not share it with other enthusiasts by sending it in to us at: Micro Tips, Home Computing Weekly, 145 Charing Cross Road, London WC2H 0EE.

Double your height VIC-20

Not many VIC-20 owners realise that double height characters can be produced on their machine. But it is possible — just enter the following program

```
10 POKE 56,24  POKE 55,0
20 A = 6144
30 POKE 36879,27
40 FOR X = A TO 7678 STEP 2
50 B = PEEK  (32768 + (X - A)
   /2)
60 POKE X,B
70 POKE X + 1,B
80 NEXT X
90 POKE 36867,PEEK (36867)
100 POKE 36869,254
110 POKE 36881,20
120 PRINT "(CLR)" NEW
```

Line 120 is to clear the screen. If the program is run/stop and restored, it must be entered again. Make sure the program is saved before running.

Philip Rudwell

Data speed VIC-20 / Commodore 64

This program may be used on a VIC-20 or Commodore 64, speeding up a file saving on both machines. As data is saved at 300 baud, any improvement is a blessing, saving both time and tape space.

The program uses routines in the ROM to save at the same baud rate, but achieves greater speed (usually 10 times faster) by saving individual bytes instead of whole variables, totally in machine code. Thus, saving speed is increased but reliability is exactly the same.

For example, to save a screen to tape, the quickest method in Basic is to use integer variables, which as a file take up five bytes each. The whole screen takes seven minutes to save. Using Dataspeed, variables are stored as 1 byte and the screen takes 40 seconds to save.

To use the program, A$ must first be set to the function you want the routine to perform: saving or loading. A% is then set to the start of memory to be saved, and B% to the finish of the memory section. The program may then be run.

Note that on loading, the variables will be stored at the same locations that they were saved from.

Machine code is stored at the top of Basic RAM. To protect it from being erased by variables, the pointer to the top of Basic RAM is lowered using lines 10 and 20.

Lines 30 to 60 poke the routine into this RAM. The mid part of the program operates this routine and converts the integer variables into a form usuable by machine code. Locations 251 to 254 are vectors for the machine code. Finally, lines 1000 onwards contain data of the machine code to be poked.

David Rees

```
1 REM# DATASPEED #
2 REM#    BY     #
3 REM#DAV13  REE##
10 POKE51,0 POKE52,159
20 POKE55,0 POKE56,159
30 FOR N=0TO41
40 READA
50 POKE40704+N,A
60 NEXT N
80 REM # A$=SAVE OR LOAD #
90 A$="SAVE"
100 REM # A%=START B%=FINISH #
110 B%=4096 B%=4332
120 AH=A%/AND255
130 AV=(A%/256)AND255
140 BH=B%AND255
150 BV=(B%/256)AND255
160 IF A$="SAVE" THEN 200
170 IF A$="LOAD" THEN 600
180 END
190 REM# SAVE #
200 POKE251,AH POKE252,AV
210 POKE253,BH POKE254,BV
220 SYS40704
230 END
300 REM# LOAD #
600 SYS40726
410 END
1000 DATA169,1,160 255
1010 DATA32 180,255
1020 DATA169,0,32,189,255
1030 DATA169,251,160,253
1040 DATA164,254,32,216,255
1050 DATA96
1060 DATA162,1,160,253
1070 DATA32 180,255
1080 DATA169,0,32,189,255
1090 DATA162,255,160,255
1100 DATA32,213,255,96
```

Take a BREAK ZX81

Every ZX81 owner knows that the BREAK key is situated in the bottom right-hand corner of the keyboard. However, we've found that if you press SHIFT, Z, V and B simultaneously, this will also interrupt a program and produce the D report code.

I also have some useful USR routines. If you type RAND USR 836, the display will freeze until only the BREAK key is engaged.

And here's an alternative to typing NEW to clear your program. If you type RAND USR 0 (followed by NEWLINE), this will act in the same way as the NEW command.

ZX81 owners are probably aware of the POKE numbers in Chapter 28 of the ZX81 manual. However, poking address 16384 can affect the screen display very dramatically. Try POKE 16384,40 or POKE 16384, 171.

Andrew Barr & Andrew Medcalf

Cap it all Oric-1

I recently discovered yet another way of turning on or off the caps lock on the Oric.

As you will already know, CHR$(20) switches caps lock, but caps lock has a toggle effect.

To get around this you can PEEK into the screen location where the caps reminder normally is.

So to switch off caps use,

```
IF PEEK (#BBA4) = 67 THEN
   PRINT CHR$(20)
```

And use the same line to switch them back on again.

J.R. Laverick

Rolling titles TI-99/4A

Here is a tip for that nice "rolling titles" effect, for the much-neglected TI-99/4A.

```
1 REM  ROLLING  TITLES
     PROGRAM
2 CALL CLEAR
3 FOR M = 1 TO 12
4 CALL COLOR (M, 6, 1)
5 NEXT M
6 CALL SCREEN (16)
7 REM  P  M-G, 1983  FOR
     HCW
10 FOR I = 1 TO 10
20 KEAD A$ (I)
30 PRINT
40 PRINT  TAB  (13)  —
     LEN(A$(I))/2, A$(I)
50 NEXT I
80 DATA ANYTHING YOU
     LIKE, COULD BE PUT, IN
     HERE, JUST ALTER THE
     LOOP, INCREMENT TO
     SUIT
70 DATA YOURSELF, YOU
     COULD EXIT PRO
     GRAM, BY
     SUBSTITUTING THE
     RESTORE, STATEMENT
     WITH CALL KEY ETC,
     GOOD COMPUTING
80 RESTORE
90 GOTO 10
```

Peter Maskell—Glynn

Amazing draws Spectrum

Try the following

```
10 PLOT 100,100 : DRAW 10,
   10,44
```

This powerful effect is probably the result of a bug in the Spectrum's ROM, but by careful manipulation we can produce some clever patterns using a small amount of memory. I offer no more examples, since this routine is best learned through practice.

Tim Boone

Direct colours Spectrum

Go into Extended mode (cursor E) after a line number and press 2. The cursor will have turned red. What we have done is altered the paper colour directly. CAPS SHIFT followed by a number 0-7 gives us directly the ink colour as printed above the appropriate key.

Using this method we can also directly employ the BRIGHT, FLASH, and INVERSE commands — see the table on page 115 of the Spectrum manual for the combinations.

The users of this are many and varied. You can highlight REM statements, manipulate colours within strings of graphics and even produce blank listings.

After the copyright message on your amazing program, go into extended mode, press CAPS SHIFT 0, and then 0 again in Extended mode. The listing will appear all black, safe from prying eyes!

Incidentally, each direct colour command takes up only two bytes instead of the eight you would use typing INK X. Enough of my chat — go away and practice.

Tim Boone

Watch that space

Our review panel boldly goes to check out another batch of space games

Startrek BBC £5.95

Logic Systems, 129 High Street, Cherry Hinton, Cambridge

Another company boldly going where others have boldly been before! For the newcomers, this game involves wandering around a grid type galaxy, exterminating Klingons and refuelling at star-bases You have control over movement, phasors, torpedoes and shields

All the standard information is given, long/short range scan, Enterprise status etc An added feature is to choose Klingon ship mobility — 0 is static, 6 is fast, and you have a time limit in which to complete your mission

There are many factors in choosing a display format on the BBC — good graphics but with little text, Model A with limited memory etc

Logic Systems have compromised with a Mode 7 text display — probably in order to get it into a model A — but have, at the expense of the graphics, got all the necessary information on screen at once

The game loaded easily and, with the aid of the cassette insert, I ventured forth a pencil and paper is also useful

It took a few plays, but the commands soon became familiar Response was fast even though the program is written in BASIC, and the game demands quick thought rather than quick reactions

Colour and sound are used effectively and the screen layout is easily read R.E

instructions	70%
playability	75%
graphics	60%
value for money	90%

★ ★ ★ ★ ★

Venus Voyager 2 Atari 400/800 32K £14.95

English Software, 50 Newton St, Piccadilly, Manchester M1 2EA

Argh! I've always believed in making games challenging at the lower levels, but this is ridiculous

The scenario is simple You have to manoeuvre your spaceship down into caverns, avoiding collisions, to rescue six people by landing on the pads

There are various static objects such as radar and space mines to be avoided

Simple? This pilot admits to rescuing one person from the six caverns with his regulation six ships

The ship responds well, and retro control is easy enough, but I just could not succeed

The ships can be refuelled in-flight but this too was beyond me

This one is for people with better reactions than mine, and a lot more patience M F

instructions	60%
playability	85%
graphics	70%
value for money	70%

★ ★ ★ ★

Operation Moon TI-99/4A (Extended BASIC) £10

Lantern Software, 4 Haffenden Road, Tenterden TN30 6QD

I have mixed feelings about this program, whose graphic excellence is marred by apparent deficiencies (still!) in the Sprite facility of Version 110 Extended BASIC

The aim is to ferry supplies from three planet-based platforms to a mother ship, avoiding collisions with an orbiting comet and confrontations with blood red banshee space bats! You can get the bats with 'glee bombs' or the comet, but you need to exercise care!

The detailed, if difficult to read instructions warn that docking must be spot-on

But on several occasions I noted either a lack of vertical movement while close, but not close enough, to the mother ship (you need to back off and try again), or an apparently perfect docking, pixel for pixel, which results in an airlock opening in space on attempting unloading and hence disaster Bugs such as these are extremely disheartening, and confusing to the novice

The degrees of difficulty offered are 1 hardest to 10 easiest and control is through the keyboard rather than joysticks Although the game will interest younger players, it does not warrant its high price P B.

instructions	80%
playability	75%
graphics	85%
value for money	40%

★ ★

Confusion 48K Spectrum £5.95

Blaby Computer Games, Crossways House, Lutterworth Rd, Blaby, Leicester

Your ship can be positioned at any one of six levels in space Alien craft then approach you from the left and right, and you must destroy them by flipping your craft through 180 degrees and shooting them down

If you miss the alien craft and they collide with you from the front or the rear, you lose the ship When you have written off five ships, the game ends

The graphics are good and so are the sound effects, but the balance of this game seems to be wrong.

There appears to be no difference in skill levels between the six levels in space and therefore, there was little point in moving

All the alien craft accrue the same points when hit and they all move at the same speed (only the colours and shapes are different)

Also, one's craft has an unlimited supply of ammunition, so there is no penalty for continuous use of the fire button In addition, there was little difference between the 'slow' and 'fast' speed options

This game seems to have quite a good potential if the plot and balance of play could be suitably redressed M B

instructions	80%
playability	60%
graphics	85%
value for money	50%

★ ★ ★

Droids Dragon 32K £5.95

J Morrison, 2 Glendale Street, Leeds LS9 9JJ

An exceedingly difficult, arcade style, shoot-out game Horrible little droids insist on removing a series of shields which support three large and deadly thoxin bombs

If they succeed, then you are immediately relieved of one of your three lives

Other ways to disaster are to be hit by the discarded lead shields as they drop, or machine gunned by one of the remaining few droids, which start moving at an incredible rate when most of their colleagues have succumbed

The droids have a further advantage in that they appear to scroll sideways round the screen, whereas you are forced to move left and right to intercept them

It is well worth the effort to clear the first screen, though, as a pleasant tune is played and you are rewarded with an extra life Second and subsequent screens are in a different colour set

There are two versions on each cassette — joystick, or an even faster version using arrow keys and space bar

Loading was always successful with no need to use the back up copy on the 'B' side The choice of colours means that a black and white TV set can be used if necessary E.C.

instructions	90%
playability	85%
graphics	90%
value for money	90%

★ ★ ★ ★ ★

Be a hero — here's the catch . . .

Help gallant Fred save the helicopter crew from a watery grave, in Geoff Allen's game for any Spectrum

What would you do if you were walking along, minding your own business, when you saw a helicopter in trouble and its crew bailing out?

This is what happened to Fred as he was crossing the bridge on the way home for his tea. Being no fool, he realised that if he didn't catch the falling men they would drop into the river and drown.

So he waited for the first men to come sailing down and — well — you can find out for yourself what happened by typing in my program for any Spectrum.

Once you have typed it in, it will draw a bridge at the bottom of the screen with Fred standing on it. As the helicopter gets lower and lower, it gets harder and harder to catch the men, but here are only 12 of them.

It can be done, but when Fred has successfully caught the first lot, along comes another helicopter, losing eight rapidly.

Use O to move Fred left and P to move him right. If you move him off the right side of the bridge, he will appear on the left.

How it works

0-100 defines graphics
300-410 main loop
1000-1220 second loop (with parachuter)
2000-2070 adds one oo to score
3000-3020 takes away one life
4000-4078 finish
5000-5500 instructions
6000-6040 "you did it!"
Note: to save, type in SAVE "PARATROOP" LINE 1

```
   5 PAPER 7: BORDER 7: INK 0: C
LS
  10 PRINT AT 10,5; FLASH 1;"Sto
p the tape"
  20 PRINT ''''''''"Do you want in
structions ";
  25 PAUSE 0
  30 IF INKEY$="y" THEN GO TO 50
00
  35 IF INKEY$<>"y" THEN GO TO 3
0
  40 GO TO 30
  50 FOR n=0 TO 7: READ a: POKE
USR "b"+n,a: NEXT n
  60 DATA 240,188,240,248,248,24
2,86,252
  70 FOR n=0 TO 7: READ a: POKE
USR "a"+n,a: NEXT n
  80 DATA 31,84,231,255,78,7,2,7
  90 FOR n=0 TO 7: READ a: POKE
USR "c"+n,a: NEXT n
 100 DATA 188,188,153,126,24,24,
36,229
 110 FOR n=0 TO 7: READ a: POKE
USR "d"+n,a: NEXT n
 120 DATA 24,60,126,255,255,231,
195,129
 130 FOR n=0 TO 7: READ a: POKE
USR "e"+n,a: NEXT n
 140 DATA 255,66,36,24,24,36,66,
255
 150 FOR n=0 TO 7: READ a: POKE
USR "f"+n,a: NEXT n
 160 DATA 126,66,66,126,8,8,1,1
 170 FOR n=0 TO 7: READ a: POKE
USR "g"+n,a: NEXT n
 180 DATA 126,70,40,48,64,64,126
,126
 200 LET hi=0
 270 LET score=0: LET lives=8
 280 INK 2: LET a=1: LET b=0: LE
T g=13
 290 LET B1=0
 294 PAPER 5: BORDER 5: CLS
 296 PRINT AT 20,0; INK 1; BRIGH
T 1;"
"
 300 PRINT AT a,b;" "
 305 PRINT AT 0,0;"Score ";score
;"    lives ";lives;"  Hi score"
;hi
 310 PRINT AT 18,0; INK 2;" "
 322 LET r=INT (RND*100)
 332 IF r>=80 THEN GO TO 1020
 342 LET b=b+1
 350 IF b=32 THEN : PRINT AT a,3
0;"  ": LET a=a+1: LET b=1
 360 IF B1=B1+8 THEN GO TO 6000
 370 IF g=1 THEN : LET g=28: PRI
NT AT 18,0;"  "
 380 IF INKEY$="o" THEN LET g=g-
1
 385 IF g=28 THEN : LET g=1: PRI
NT AT 18,28;"  "
 390 IF INKEY$="p" THEN LET g=g+
1
 410 GO TO 300
1000 LET c=a+1: LET d=b: LET e=a
+3
1005 IF d=0 OR d=1 OR d>=28 THEN
 GO TO 300
1100 PRINT AT a,b;" "
1110 PRINT AT 0,0;"Score ";score
;"    lives ";lives;"  Hi score"
;hi
1120 PRINT AT 18,g; INK 2;" "
1125 PRINT AT c-1,d;" "
1130 PRINT AT c,d; INK 7;"A"
1140 PRINT AT e,d;"X"
1150 LET b=b+1
1155 IF e=18 THEN GO TO 7000
1157 LET c=c+1: LET e=e+1
1160 IF b=28 THEN : PRINT AT a,3
0;"  ": LET a=a+1: LET a=0
1170 IF B1=B1+8 THEN GO TO 6000
1180 IF g=1 THEN : LET g=28: PRI
NT AT 18,0;"  "
1190 IF INKEY$="o" THEN LET g=g-
1
1195 IF g=28 THEN : LET g=1: PRI
NT AT 18,28;"  "
1200 IF INKEY$="p" THEN LET g=g+
1
1220 GO TO 1120
2000 LET B1=B1+1
2001 PRINT AT c,d;" "
2005 FOR n=0 TO 7
2010 BORDER n
2020 BEEP .1,n
2030 NEXT n
2040 LET score=score+1
2050 PRINT AT c,d;" "
```

Hints on conversion

There are seven different graphics used in my program. Three for the bridge, two for the helicopter and two for the parachutist. The man on the ground is the same graphic as the bottom half of the parachutist.

The Spectrum uses a grid for its graphics and FOR/NEXT loops to create them.

PAPER controls the background colour,
INK controls the foreground colour and
BORDER controls the border colour
BRIGHT means exactly that and can be omitted if your computer doesn't have this feature
CLEAR means 'clear the screen'
FLASH means flash on and off like BRIGHT it can be omitted.

The Spectrum's screen arrangement is 20 lines down by 32 lines across. Line 0 is the first number in both cases.

So line 10 which says
10 PRINT AT 10,5; FLASH 1; "Stop the tape"
means print at line 10,5 which on the Spectrum is roughly in the middle, flashing "stop the tape".

The Spectrum's sound is controlled by the **BEEP** statement. The only one used is in line 2020. This line can easily be changed for your computer.

Variables

score your score
hi high score
lives lives left
a y coordinate of helicopter
b x coordinate of helicopter
g x coordinate of Fred
Q1 number of paratroopers

SPECTRUM PROGRAM

```
2050 PRINT AT e,d," "
2055 BORDER 5
2057 IF 01=10 THEN GO TO 5000
2070 GO TO 300
3000 BEEP 1,-20
3010 LET lives=lives-1
3013 IF lives=0 THEN GO TO 4000
3015 PRINT AT c,d," ". PRINT AT
e,d," "
3017 IF 01=10 THEN GO TO 5000
3020 GO TO 300
4000 PAPER 2. INK 7. BORDER 2. C
LS
4020 IF score>hi THEN PRINT AT 0
,0, INK 7," You got the new high
 score !!"
4021 IF score>hi THEN LET hi=sco
re
4030 PRINT AT 4,4," You got ",sc
ore
4040 PRINT AT 10,0," Do you want
 to play again ?"
4070 IF INKEY$="y" THEN GO TO 27
0
4075 IF INKEY$="n" THEN NEW
4075 GO TO 4070
5000 PAPER 7  BORDER 7. INK 0  C
LS
5010 PRINT "By Geoff Allen"
5020 PRINT ."[redacted]"
5030 PRINT ''' You are Fred.You
are just  walking along the
 old railway "
5040 PRINT " bridge when you see
 a Chopper   in trouble.Its cre
w are bailing out and you must c
atch them "
5050 PRINT " or they will fall o
f the bridge and drown.When you
have got all 12 down you start a
gain"
5060 PRINT '''"                O   P
"""
```

```
5500 PAUSE 0   GO TO 50
6000 FOR n=0 TO 10
6010 BEEP .08,10
6020 NEXT n
6030 PRINT AT 10,0, FLASH 1,"You
 did it"
6032 PAUSE 0
6033 PAUSE 3
6035 PAUSE 0
6040 GO TO 250
7000 IF d=g+.5 OR d=g+1 OR d=g+1
.5 THEN GO TO 2000
7010 GO TO 3000
```

Domestic dramas on-screen

Instead of dodging laser bolts and asteroids, the hazards you'll meet in these games are more down to earth

Demon Decorator
BBC B £7.95

Program Power, 8/8a Regent Street, Chapel Allerton, Leeds LS7 4PE

This is the kind of decorating I could enjoy The game features the unlikely combination of a paint roller chased by an octopus around a grid The aim is to guide the roller to paint in the grid squares and points are awarded for each square completed

If the octopus gets too close for comfort pressing the 'stun' key immobilises him for a few seconds Only five stuns are available, unless you can collect extra stun diamonds on your travels around the grid The completion of a full grid earns you an extra roller

The instructions on the cassette insert are adequate and the program also indicates which keys to use

The graphics are quite good and the action is smooth, apart from the actual filling in of a square which is a little jerky

As each grid is completed the octopus gets a little faster on the next level — so save those stuns as long as you can

One useful feature, games programmers please note, is a pause and restart facility, which is just the thing for those occasions when the phone rings as you are about to beat your high score

No obvious bugs were detected, although occasionally the roller did seem to have a mind of its own D H

instructions	60%
playability	80%
graphics	75%
value for money	75%

★ ★ ★ ★

Quackers
Spectrum £5.99

Rabbit, 380 Station Road, Harrow HA1 2DE

Roll up, roll up! Take off your jacket, take aim and take your best shot at 'Quackers' a delightful and diverting game for the young at heart

The game is set, as you may have guessed, in a shooting gallery and you are invited to take pot shots at moving cats, bunnies, ducks, faces and even a full size if rather docile, turtle!

Good use is made of colour graphics and sound — the game feels like a shooting gallery with the numerous targets moving in different directions

The faces are quite hard to hit due to the presence of a moving wall in front of them with only a small gap in it If you manage to hit all the targets within the time limit you get to take on the turtle

In my view the game is a little too easy and lacks lasting playability for this The turtle was an easy 200 points! Nevertheless this novel game will probably become a firm favourite among Spectrum owning children and tired parents longing for a change from 'shoot em up' games T B

instructions	60%
playability	55%
graphics	70%
value for money	60%

★ ★ ★

Danger Mower
BBC B £5.95

Logic Systems, 129 High Street, Cherry Hinton, Cambridge

Danger Mower is original but also rather boring, unfortunately The aim of the game is to steer your mower around a lawn and avoid the hazards you meet along the way — cowpats, rocks, and walls

You have also to collect fuel for the mower, which is spread in cans over the lawn too You collect points for the areas of the lawn you haven t already cut and leave a yellow trail behind your mower so that you know where you've been

The colours are rather difficult to see unless you have a good monitor, as the yellow cut path on the green lawn shows very little contrast The graphics are only fair too, using just four colours This is a real pity, as they could have raised my enjoyment of the game considerably

There is also a constantly playing tune which, although pleasant in the short term, is wearing over long periods You can, however, turn this down if you wish

I found the dexterity involved enjoyable, but the lawn was far too big to complete before losing concentration I have begun to expect more than software houses than this program gives and I feel that it is vastly overpriced

D C

instructions	60%
playability	50%
graphics	60%
value for money	30%

★ ★

Centipede
Oric-1 £6.95

PSS, 452 Stoney Stanton Road, Coventry, CV6 5DG

Featuring the usual multi legged creature wandering round the garden at high speed in between the mushrooms, and backed up by mushroom laying bugs, fleas and a spider that appears when you have shot down all segments of the centipede for the first time

Starting with three lives, the object is to eliminate the centipede that is travelling down the screen before it, or any of the other insects get you As you fire at the centipede, it breaks up and attacks from different angles

If you kill the centipede, the game restarts with fresh sheet and, on the third sheet, a mushroom laying bug will drop from the top of the screen On the fifth, there are two centipedes to contend with, but it is difficult to reach this stage

Although the sound levels are not high, graphics are good but unfortunately the centipede, mushrooms and spider, along with your gun, are all in white, and lack colour variety The only brief flash of colour is when you have shot down the centipede

Centipede is an addictive game and PSS provides a quick moving all-action version But I've seen better — and cheaper versions

instructions	85%
playability	70%
graphics	75%
value for money	55%

★ ★ ★

Worm
48K Oric £4.95

Pasesoft, 213 215 Market Street, Hyde, Cheshire, SK1 1HF

If the title sounds familiar then it's because this is another rendering of an old favourite, which usually goes by the name of snake

The scenario follows the usual pattern you are a worm (somehow it doesn t sound as glamorous as a snake) and your aim in life is to move around the garden eating any stray numbers which you may come across

With each meal your body increases in length according to the size of the number you eat Unfortunately for you you cannot stop moving and so as the game progresses it becomes increasingly difficult to avoid eating your own body (and consequently killing yourself)

As if that isn t enough to contend with there are various other nasties (fortunately stationary) such as spiders and flowers randomly strewn about the garden Contact with any of these or the garden wall kills you for no readily apparent reason

This is a competent attempt at a fairly straightforward game It is fast enough to give it that addictive quality and the inclusion of nine different levels of play should keep you occupied for quite a while Another nice touch is a hall of fame to save you noting down your best score of the day

G P

instructions	60%
playability	75%
graphics	55%
value for money	70%

★ ★ ★ ★

Set your sights on ducks instead

Your chance to test your skill at the computer version of a fairground shooting gallery. Alan Gray's Duck Shoot game runs on the Dragon, with joystick

Hints on conversion

It would be rather difficult to convert Duck Shoot to run on another computer as the Dragon has rather special hi-res graphics commands, such as GET and PUT. The best way is to use the idea and write your own program. Sorry, folks!

If you are fed up with blasting alien invaders try blasting ducks instead.

My program for the Dragon, with joystick, is loosely based on the fairground shooting gallery.

The joystick acts as your rifle and the button is the trigger.

At the start of each game you get 10 shots and the duck will pass 15 times at a random speed to make it even more tricky to anticipate its position.

Duck Shoot is written in BASIC mode 3 with a machine code routine to simulate the gunshot sound.

If your Dragon does not support the high speed POKE, delete line 10 and that POKE (&HFFD7,0) in line 390.

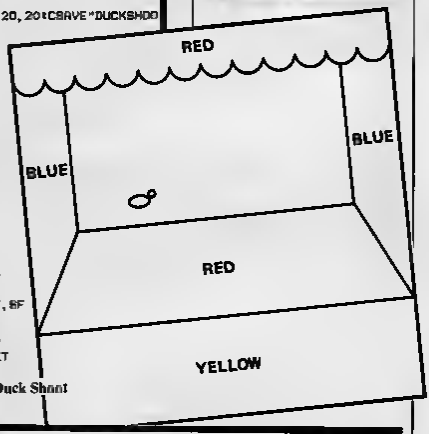
Main variables

GETA yellow duck
GETB green duck
U and **I** DRAW loop for half circles on canvas top of booth
HT hit counter
SH shot counter
JO joystick inputs
R main loop
RD rifle starting point
X1,X2,Y1,Y2 co-ordinates for rifle
FR detect fire button
C detect hit
X random speed for duck

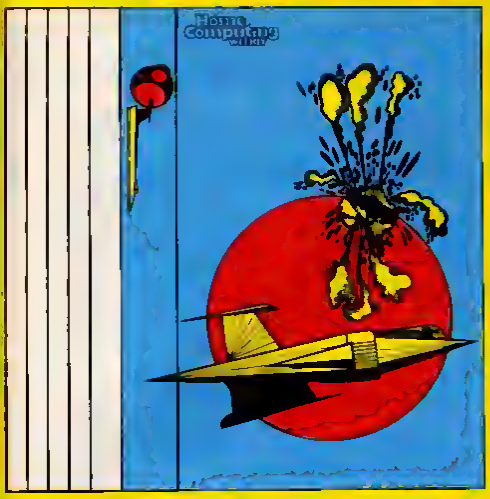
```
1 REM A.GRAY   1983
10 POKE&HFFD7,0
15 GOTO580
20 GOTO540
30 POKE&HFFD6,0:MOTOPON:SOUND120,20:CSAVE"DUCKSHOO
T":STOP
40 PMODE3,1:PCLS:COLOR2
50 DRAW"BM18,19;R1E1H1L1G1F1"
60 DRAW"BM10,24;R5E2H2L5G2F2"
65 PAINT(14,22),2,2
70 DIMA(11)
80 SET(0,10)-(20,30),A,G:PCLS
90 COLOR1
100 DIMB(11)
110 DRAW"BM18,19;R1E1H1L1G1F1"
120 DRAW"BM10,24;R5E2H2L5G2F2"
130 GET(0,10)-(20,30),B,G
140 COLOR3,1
150 LINE(0,90)-(255,90),PSET
160 COLOR2,1
170 LINE(58,91)-(219,91),PSET
180 COLOR4,1
190 LINE(0,0)-(0,152),PSET
200 LINE(0,0)-(255,0),PSET
210 LINE(255,0)-(255,255),PSET
220 COLOR2,1
230 LINE(0,152)-(255,255),PSET,BF
240 LINE(36,10)-(36,92),PSET
250 LINE(36,92)-(0,152),PSET
260 LINE(219,10)-(219,92),PSET
270 LINE(219,92)-(255,152),PSET
280 FOR I=170252 STEP18:FORU=1TO10:CIRCLE(10+I,10),
10,2,1,0,.5:NEXTU:NEXTI
290 PAINT(0,0),4,2
300 PAINT(0,15),3,2
310 PAINT(220,25),3,2
320 PAINT(60,99),4,2
330 COLOR1
350 TIMER=0:HT=0:SH=0:JO=JOYSTK(0)
360 FOR R=1 TO 15
370 RD=38:X=RND(3)+4
380 X1=RD:X2=RD:Y1=132:Y2=150
350 POKE&HFFD7,0:SCREEN1,0:FOR1=4670195 STEP X:PUT
(1,80)-(1+20,80),A,PSET
400 JO=JOYSTK(0):#2,S:LINE(X1+JO,Y1+JY)-(X2+JO,Y2+J
Y),PSET
410 FR=PEEK(65280)
420 IF FR=126 ORFR=254 THEN GOSUB450:SH=SH+1
430 IFSH=10 THEN 590
440 COLOR1,4
450 LINE(X1+JO,Y1)-(X2+JO,Y2),PRESET
460 NEXTI:LINE(195,80)-(212,80),PSET,BF
470 NEXTR
480 GOTO590
490 EXEC32000
500 COLOR4,1
510 C=PRINT(X1+JO,70)
520 IFC=4 THEN PUT(1,80)-(1+20,80),B,PSET:I=46:HT=
HT+1
530 RETURN
540 CLEAR 200,31999
550 FORI=1 TO 53:READ A$:Z=VAL("&H"+A$):POKE31999+
I,Z:NEXT
560 DATA 54,12,8E,FF,23,8A,08,B7,FF,23,7F,01,47,8E
,B7,98,A6,80,8D,14,A6,80
570 DATA 80,10,7A,01,47,26,F3,8E,FF,23,84,F7,B7,FF
,23,35,12,39,E4,01,47,B7,FF,20,8E,41,4A,26,FD,39,0
0,00
580 GOTO40
590 CLS:SCREEN 0 1
600 PRINT@10,"DUCK SHOOT"
610 PRINT@42,"---- -----"
620 PRINT@200,"YOUR SCORE IS ";HT
630 PRINT@264,"WITH ";SH;" SHOTS
640 PRINT@328,"IN ";INT (T)MER/60);"SECONDS"
650 PRINT@419,"PRESS ANY KEY TO CONTINUE"
660 EXEC41134
670 GOTO350
680 SCREEN0,0:CLS
690 PRINT@10,"DUCK SHOOT":PRINT@42,"---- -----"
700 PRINT"INSTRUCTIONS FOR PLAY :PRINT
710 PRINT"THE JOYSTICK MOVES THEN FLASHINGGUN LEFT
 OR RIGHT"
720 PRINT:PRINT"THE BUTTON FIRES THE GUN,YOU","HAV
E 10 SHOTS AND THE DUCK WILL PASS ONLY 15 TIMES"
730 PRINT:PRINT"AT THE END OF THE GAME YOUR ","SCO
RE WILL BE PRINTED"
750 GOTO20
```

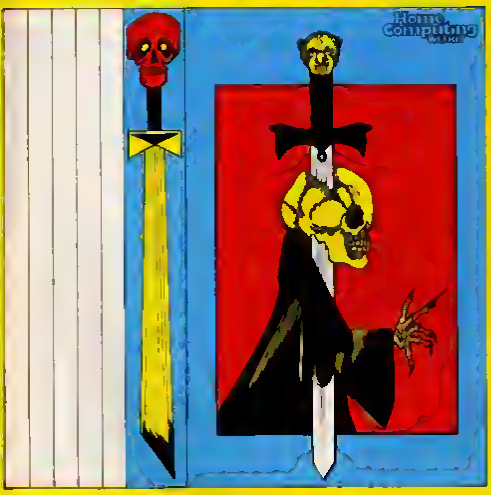
How it works

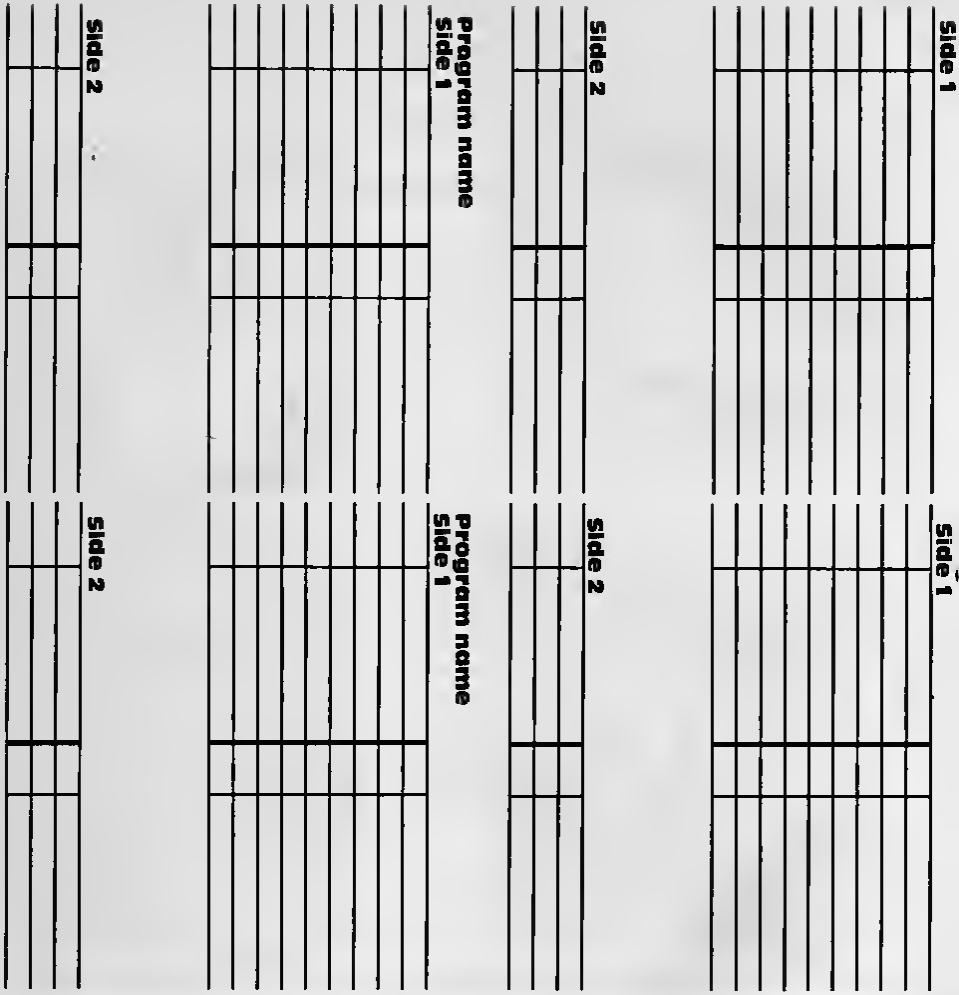
50-80 DRAW and GET yellow duck
90-130 DRAW and GET green duck
140-330 DRAW and PAINT show booth
360-470 main play loop
390 PUT yellow duck on screen and move it along four points at a time
500-530 hit loop
400 READ joystick, DRAW gun
450 fill in gun drawing
460 fill in duck at end of run
520 PUT green duck on screen if yellow one is hit
540-570 machine code shot sound
590-670 scoreboard
680-750 instructions



How the screen looks when you play Duck Shoot







Your free inlays — just cut them out and place them inside your cassette boxes. They're ideal for recording your own programs and the listings you type in from Home Computing Weekly. Drawings by Chris Adam-Smith

You're a film producer, thanks to the computer

Link your computer and a video recorder and you can create some great graphics and sound effects on the screen. Brian Hughes shows you how

If you have seen the Walt Disney film Tron you will know how animation can be created by computers.

Each frame of the film was composed of millions of pixels, using huge mainframe computers.

The Dragon's maximum of 49152 pixels seems meek in comparison, but they can still be used to great effect if you have an ordinary home video recorder.

The diagram shows how to set up the video so it will record pictures from the computer.

Make sure first that you have enough mains sockets within easy reach — and don't overload any one socket.

Set up the computer and video recorder as usual, then take the aerial lead out of the video and in its place put the computer's TV lead. Any picture or sound that is transferred to your usual TV can also be transferred to a video recorder.

Try taping an arcade game. You can analyse it to find your weak points and improve your ability at the game.

Although you probably haven't noticed it yet, you have already witnessed one of the advantages the Dragon has over its rivals: channelled sound.

Most other computers, like the Spectrum and the Oric, produce sound internally and do not transfer it to the TV. As a result, it would also not be transmitted to the video recorder.

Using a computer like the Dragon, you could channel prerecorded sounds from an audio cassette to a video cassette very easily.

This can be used to add sound effects to an animated sequence, or to add music to a home-made pop video.

Here is how to add sounds to animation using the Dragon:

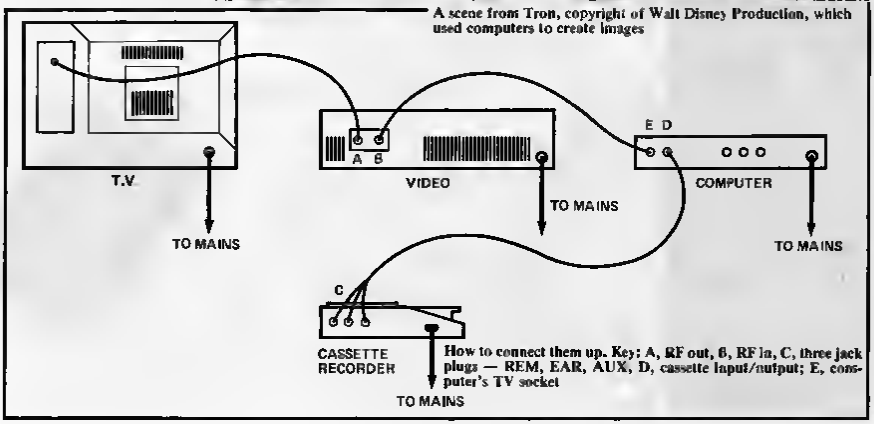
1 Record the sound effects on a cassette tape
2 Set up the video recorder and computer as I've described
3 Load or tape the program for the sequence
4 Type AUDIOON - MOTORON RUN. Do not press enter yet
5 Find the recorded effects on the cassette and press play (the tape recorder should not start until the enter key has been pressed)
6 Press record/play on the video recorder and press the enter key on the computer

The program will now be taped on the video recorder with the sound effects added.

In my opinion, the best use of this technique is for the credits and titles at the beginning and end of a film.

However, a really enthusiastic film maker could take over where Disney left off.

A scene from Tron, copyright of Walt Disney Production, which used computers to create images



How to connect them up. Key: A, RF out, B, RF In, C, three jack plugs — REM, EAR, AUX, D, cassette input/output; E, computer's TV socket

It's your move — against the Spectrum

Try to get a row of four before the computer does, in David Haworth's game of strategy for any Spectrum

How it works

The game is played in an array a(m,n), where m denotes the column and n the row number, counting from the bottom row. Each element in the array can have one of three values: +1 (occupied by the computer), 1 (occupied by the human player) and 0 (empty).

A winning row of 4 in any direction will therefore total +4 if the computer has won, and 4 if the player has won. A total of +3 or 3 in any row of four elements indicates a potential winning move by the computer and human respectively.

Block by block, this is how the program works:

1-3 assigns values to the variables used in the program. These remain fixed values, used to avoid use of numbers in program lines.

5-7 print column numbers on screen.

10-70 direct the program through the various subroutines in the proper sequence.

1000-2940 subroutine to determine the computer's move. It calculates the sum of all combinations of four elements in a row within the array.

If this is three, then a potential winning move is indicated. If the vacant space is on the bottom row, the computer occupies it and wins.

If on higher rows, it first checks to see if the space below is occupied to determine if a winning move is possible.

In 2000-2620 it checks to see if a blocking move is required. This is a similar routine to the one above, except the check is for a total of 3 in any row of four.

If no winning or blocking move has been found, the program proceeds to 2700-2940, which will complete any line of two moves, for either computer or human, in the horizontal or vertical directions.

If no directed move is found, the program jumps to 3950 to make a random move.

3950-3980 subroutine to determine random move for computer.

5000-5270 subroutine to check if game has been won.

6000-6120 subroutine to get player's move (print eight spaces in line 6070).

8000-8100 sets up array and draws frame. Note CODE "FN" = 168, CODE "[illegible]" = 39, CODE "CAT" = 207.

9000-9120 end of game.

Variables

a	1
b	2 and so on until
g	7
z	0
k	7000
l	9000
p	9100
v	60 (note CODE "('less than' sign)" = 60

Hints on conversion

The program is written in simple BASIC with a minimum of graphics so conversion to other computers should be straightforward.

```
   1 LET a=VAL "1": LET b=VAL "2": LET c
=VAL "3": LET d=VAL '4': LET e=VAL "5": 
LET f=VAL "6"
   2 LET g=VAL "7": LET z=VAL '0'
   3 LET k=VAL "7e3": LET l=VAL '9e3': L
ET p=VAL "9100"
   4 CLS
   5FOR x=a TO g
   6 PRINT AT z,c+c*x;x
   7 NEXT x
   8 LET v=CODE "<"
  10 GO SUB VAL "8e3"
  15 GO SUB VAL"3950"
  17 GO SUB k
  20 GO SUB VAL "6e3"
  25 GO SUB k
  30 GO SUB VAL "5e3"
  40 GO SUB VAL "1e3"
  50 GO SUB k
  70 GO TO VAL "20"
1000 BEEP a/g,e
1001 FOR m=a TO d
1010 IF a(m,a)+a(m+a,a)+a(m+b,a)+a(m+c,a
)=c THEN GO TO VAL "1030"
1020 NEXT m
1025 GO TO VAL "1070"
1030 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO p
1040 IF a(m+a,a)=z THEN LET a(m+a,a)=a:
GO SUB k: GO TO p
1050 IF a(m+b,a)=z THEN LET a(m+b,a)=a:
GO SUB k: GO TO p
1060 IF a(m+c,a)=z THEN LET a(m+c,a)=a:
GO SUB k: GO TO p
```

```
1070 FOR m=a TO d
1080 FOR n=b TO f
1090 IF a(m,n)+a(m+a,n)+a(m+b,n)+a(m+c,n
)=c TNEN GO SUB VAL "1130"
1100 NEXT n
1110 NEXT m
1120 GO TO VAL "1170"
```

My game is a relaxed alternative to the usual shoot-em-up computer games. No fast reactions are required — all you need is logic.

The game is played in a seven by six array, and the first player to get four squares in a row — either horizontally, vertically or diagonally — wins.

The computer has first move, to compensate for its inferior intelligence. Its moves are printed as O and yours are printed as X.

As you play, the computer's skill level will reflect your own skill level in understanding the logic of the game and translating it into computer logic.

Unfortunately, in the 16K Spectrum there wasn't enough memory for all the logic I wanted to include. If you have the 48K version, there is plenty of scope to extend the program between lines 2940 and 3950.

In particular, I would suggest logic to make the computer play a more attacking game, and logic to stop the computer from making random moves which are advantageous to its human opponent.

You could also improve the graphics, colour and sound.

```
1130 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO p
1140 IF a(m+a,n)=z AND a(m+a,n-a)<>z THE
N LET a(m+a,n)=a: GO SUB k: GO TO p
1150 IF a(m+b,n)=z AND a(m+b,n-a)<>z THE
N LET a(m+b,n)=a: GO SUB k: GO TO p
1160 IF a(m+c,n)=z AND a(m+c,n-a)<>z THE
N LET a(m+c,n)=a: GO SUB k: GO TO p
1165 RETURN
1166BEEP a/9,a
1170 FOR m=a TO g
1180 FOR n=a TO c
1190 IF a(m,n)+a(m,n+a)+a(m,n+b)+a(m,n+c
)=c THEN GO TO VAL '1220"
1200 NEXT n
1210 NEXT m
1215 GO TO VAL "1230"
1220 LET a(m,n+c)=a: GO SUB k: GO TO p
1230 FOR m=a TO d
1240 FOR n=b TO c
1250 IF a(m,n)+a(m+a,n+a)+a(m+b,n+b)+a(m
+c,n+c)=c THEN GO SUB VAL "1290"
1260 NEXT n
1270 NEXT m
1280 GO TO VAL "1340"
1300 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO p
1310 IF a(m+a,n+a)=z AND a(m+a,n)<>z THE
N LET a(m+a,n+a)=a: GO SUB k: GO TO p
1320 IF a(m+b,n+b)=z AND a(m+b,n+a)<>z T
HEN LET a(m+b,n+b)=a: GO SUB k: GO TO p
1330 IF a(m+c,n+c)=z AND a(m+c,n+b)<>z T
HEN LET a(m+c,n+c)=a: GO SUB k: GO TO p
1335 RETURN
1340FOR m=d TO g
1350 FOR n=b TO c
1360 IF a(m,n)+a(m-a,n+a)+a(m-b,n+b)+a(m
-c,n+c)=c THEN GO SUB VAL "1460"
1370 NEXT n
1380 NEXT m
1390 GO TO VAL "1450"
1410 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO p
1420 IF a(m-a,n+a)=z AND a(m-a,n)<>z THE
N LET a(m-a,n+a)=a: GO SUB k: GO TO p
1430 IF a(m-b,n+b)=z AND a(m-b,n+a)<>z T
HEN LET a(m-b,n+b)=a: GO SUB k: GO TO p
1440 IF a(m-c,n+c)=z AND a(m-c,n+b)<>z T
HEN LET a(m-c,n+c)=a: GO SUB k: GO TO p
1445 RETURN
1450FOR m=a TO d
1460 IF a(m,a)+a(m+a,b)+a(m+b,c)+a(m+c,d
)=c THEN GO SUB VAL "1490"
1470 NEXT m
1480 GO TO VAL "1540"
1490 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO p
1500 IF a(m+a,b)=z AND a(m+a,a)<>z THEN
LET a(m+a,b)=a: GO SUB k: GO TO p
1510 IF a(m+b,c)=z AND a(m+b,b)<>z THEN
LET a(m+b,c)=a: GO SUB k: GO TO p
1520 IF a(m+c,d)=z AND a(m+c,c)<>z THEN
LET a(m+c,d)=a: GO SUB k: GO TO p
1530 RETURN
1540FOR m=d TO g
1550 IF a(m,a)+a(m-a,b)+a(m-b,c)+a(m-c,d
)=c THEN GO SUB VAL '1580'
1560 NEXT m
1570 GO TO VAL "1630"
1580 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO p
1590 IF a(m-a,b)=z AND a(m-a,a)<>z THEN
LET a(m-a,b)=a: GO SUB k: GO TO p
1600 IF a(m-b,c)=z AND a(m-b,b)<>z THEN
LET a(m-b,c)=a: GO SUB k: GO TO p
1610 IF a(m-c,d)=z AND a(m-c,c)<>z THEN
LET a(m-c,d)=a: GO SUB k: GO TO p
1620 RETURN
2000BEEP a/9,c
2001 FOR m=a TO d
2010 IF a(m,a)+a(m+a,a)+a(m+b,a)+a(m+c,a
)=-c THEN GO TO VAL "2030"
2020 NEXT m
2025 GO TO VAL "2070"
2030 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO v
2040 IF a(m+a,a)=z THEN LET a(m+a,a)=a:
GO SUB k: GO TO v
2050 IF a(m+b,a)=z THEN LET a(m+b,a)=a:
GO SUB k: GO TO v
2060 IF a(m+c,a)=z THEN LET a(m+c,a)=a:
GO SUB k: GO TO v
2070 FOR m=a TO d
2080 FOR n=b TO f
2090 IF a(m,n)+a(m+a,n)+a(m+b,n)+a(m+a,n
)=-c THEN GO SUB VAL "2130"
2100 NEXT n
2110 NEXT m
2120 GO TO VAL "2170"
2130 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO v
2140 IF a(m+a,n)=z AND a(m+a,n-a)<>z THE
N LET a(m+a,n)=a: GO SUB k: GO TO v
2150 IF a(m+b,n)=z AND a(m+b,n-a)<>z THE
N LET a(m+b,n)=a: GO SUB k: GO TO v
2160 IF a(m+c,n)=z AND a(m+c,n-a)<>z THE
N LET a(m+c,n)=a: GO SUB k: GO TO v
2165 RETURN
2170FOR m=a TO g
2180 FOR n=a TO c
2190 IF a(m,n)+a(m,n+a)+a(m,n+b)+a(m,n+c
)=-c THEN GO TO VAL "2220"
2200 NEXT n
2210 NEXT m
2215 GO TO VAL '2230"
```

```
2220 LET a(m,n+c)=a: GO SUB k: GO TO v
2230 FOR m=a TO d
2240 FOR n=b TO c
2250 IF a(m,n)+a(m+a,n+a)+a(m+b,n+b)+a(m
+c,n+c)=-c THEN GO SUB VAL "2290'
2260 NEXT n
2270 NEXT m
2280 GO TO VAL "2340"
2300 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO v
2310 IF a(m+a,n+a)=z AND a(m+a,n)<>z THE
N LET a(m+a,n+a)=a: GO SUB k: GO TO v
2320 IF a(m+b,n+b)=z AND a(m+b,n+a)<>z T
HEN LET a(m+b,n+b)=a: GO SUB k: GO TO v
2330 IF a(m+c,n+c)=z AND a(m+c,n+b)<>z T
HEN LET a(m+c,n+c)=a: GO SUB k: GO TO v
2335 RETURN
2340FOR m=d TO g
2350 FOR n=b TO c
2360 IF a(m,n)+a(m-a,n+a)+a(m-b,n+b)+a(m
-c,n+c)=-c THEN GO SUB VAL "2400"
2370 NEXT n
2380 NEXT m
2390 GO TO VAL "2450"
2410 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO v
2420 IF a(m-a,n+a)=z AND a(m-a,n)<>z THE
N LET a(m-a,n+a)=a: GO SUB k: GO TO v
2430 IF a(m-b,n+b)=z AND a(m-b,n+a)<>z T
HEN LET a(m-b,n+b)=a: GO SUB k: GO TO v
2440 IF a(m-c,n+c)=z AND a(m-c,n+b)<>z T
HEN LET a(m-c,n+c)=a: GO SUB k: GO TO v
2445 RETURN
2450FOR m=a TO d
2460 IF a(m,a)+a(m+a,b)+a(m+b,c)+a(m+c,d
)=-c THEN GO SUB VAL "2490'
2470 NEXT m
2480 GO TO VAL "2540'
2490 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO v
2500 IF a(m+a,b)=z AND a(m+a,a)<>z THEN
LET a(m+a,b)=a: GO SUB k: GO TO v
2510 IF a(m+b,c)=z AND a(m+b,a)<>z THEN
LET a(m+b,c)=a: GO SUB k: GO TO v
2520 IF a(m+c,d)=z AND a(m+c,c)<>z THEN
LET a(m+c,d)=a: GO SUB k: GO TO v
2530 RETURN
2540FOR m=d TO g
2550 IF a(m,a)+a(m-a,b)+a(m-b,c)+a(m-c,d
)=-c THEN GO SUB VAL "2580'
2560 NEXT m
2570 GO TO VAL "2630"
2580 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO v
2590 IF a(m-a,b)=z AND a(m-a,a)<>z THEN
LET a(m-a,b)=a: GO SUB k: GO TO v
2600 IF a(m-b,c)=z AND a(m-b,b)<>z THEN
LET a(m-b,c)=a: GO SUB k: GO TO v
2610 IF a(m-c,d)=z AND a(m-c,c)<>z THEN
LET a(m-c,d)=a: GO SUB k: GO TO v
2620 RETURN
2700FOR m=b TO d
2710 IF ABS (a(m,a)+a(m+a,a)+a(m+b,a))=2
 THEN GO TO VAL "2740"
2720 NEXT m
2730 GO TO VAL "2800"
2740 IF a(m,a)=z THEN LET a(m,a)=a: GO S
UB k: GO TO v
2750 IF a(m+a,a)=z THEN LET a(m+a,a)=a:
GO SUB k: GO TO v
2760 IF a(m+b,a)=z THEN LET a(m+b,a)=a:
GO SUB k: GO TO v
2800 FOR m=b TO d
2805 FOR n=b TO f
2810 IF ABS (a(m,n)+a(m+a,n)+a(m+b,n))=2
 THEN GO SUB VAL "2840"
2820 NEXT n
2825 NEXT m
2830 GO TO VAL "2900"
2840 IF a(m,n)=z AND a(m,n-a)<>z THEN LE
T a(m,n)=a: GO SUB k: GO TO v
2850 IF a(m+a,n)=z AND a(m+a,n-a)<>z THE
N LET a(m+a,n)=a: GO SUB k: GO TO v
2860 IF a(m+b,n)=z AND a(m+b,n-a)<>z THE
N LET a(m+b,n)=a: GO SUB k: GO TO v
2870 RETURN
2900FOR m=a TO g
2910 FOR n=a TO c
2920 IF ABS (a(m,n)+a(m,n+a)+a(m,n+b))=b
 THEN LET a(m,n+b)=a: GO SUB k: GO TO v
2930 NEXT n
2940 NEXT m
3950 LET m=a+INT (RND*g)
3960 LET n=a
3965 IF n=g THEN GO TO VAL "3950"
3970 IF a(m,n)<>z THEN LET n=n+a: GO TO
VAL "3965"
3975 LET a(m,n)=a
3980 RETURN
5000FOR m=a TO g
5010 FOR n=a TO c
5020 LET s=a(m,n)+a(m,n+a)+a(m,n+b)+a(m,
n+c)
5030 IF s=d THEN GO TO p
5040 IF s=-d THEN GO TO l
5050 NEXT n
5060 NEXT m
5065 BEEP a/9,c
5070 FOR m=a TO d
5080 FOR n=a TO f
5090 LET s=a(m,n)+a(m+a,n)+a(m+b,n)+a(m+
c,n)
5100 IF s=d THEN GO TO p
5110 IF s=-d THEN GO TO l
5120 NEXT n
```

```
5130 NEXT m
5140 FOR m=a TO d
5150 FOR n=a TO c
5160 LET s=a(m,n)+a(m+a,n+c)+a(m+b,n+b)+
a(m+c,n+c)
5170 IF s=d THEN GO TO p
5180 IF s=-d THEN GO TO l
5190 NEXT n
5195 NEXT m
5200 FOR m=d TO g
5210 FOR n=a TO c
5220 LET s=a(m,n)+a(m-a,n+c)+a(m-b,n+b)+
a(m-c,n+c)
5230 IF s=d THEN GO TO p
5240 IF s=-d THEN GO TO l
5250 NEXT n
5260 NEXT m
5270 RETURN
6000BEEP a,z
6001 INPUT "Your move (col)";a$
6010 LET m=VAL a$(1)
6020 IF m<a OR m>g THEN BEEP ,5,z: GO TO
 VAL "6000"
6030 LET n=a
6040 IF n=g THEN GO TO VAL "6090"
6050 IF a(m,n)<>z THEN LET n=n+a: GO TO
VAL "6040"
6060 LET a(m,n)=-a
6070 PRINT AT 21,0;"                    "
6080 RETURN
6090PRINT AT 21,0;"Col Full"
6110 BEEP ,5,10
6120 GO TO VAL "6e3"
7000 FOR m=a TO g
7010 FOR n=a TO f
7020 IF a(m,n)=a THEN PRINT AT n*(-c)+21
,m*c+c;"O": BEEP a/e,b*m
7025 IF a(m,n)=-a THEN PRINT AT n*(-c)+2
1,m*c+c;"X": BEEP a/z,b*m
7030 IF a(m,n)=z THEN PRINT AT n*(-c)+21
,m*c+c;" "
7040 NEXT n
7060 NEXT m
7070 RETURN
8000DIM a(g,l)
8020 FOR i=CODE "?" TO CODE " CAT " STEP
 VAL "24"
8030 PLOT i,16
8040 DRAW z,VAL "144"
8050 NEXT i
8060 FOR j=16 TO VAL "160" STEP VAL "24"
8070 PLOT CODE "?",j
8080 DRAW CODE "FN ",z
8090 NEXT j
8100 RETURN
9000PRINT "You win"
9005 BEEP b,z: BEEP b,b: BEEP a,c: BEEP
a,b: BEEP b,z
9010 GO TO VAL "9105"
9100 PRINT "I win"
9102 BEEP a,12: BEEP a,z
9105 INPUT "Another Game?";a$
9110 IF a$(1)="y" THEN RUN
9120CLS
```

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Dig for a fortune in gems

Glittering prizes await you in Jewel Mining, a game for the TI-99/4A by James Wilson. But first you must avoid the hazards . . . and beat the clock

You'll find out just how dangerous mining can be when you play my game for the unexpanded TI-99/4A.

To reach the jewels you must avoid falling rocks and hammers, open mine shafts and the Mine Guardians. And you have to reach the top before the timer counts down to zero.

After the instructions are displayed there will be a pause while the array holding the positions of the rocks is built up.

Then the screen will clear and the course will be displayed, consisting of a counter in the bottom left, a cave containing the three jewels in the bottom centre and, a passageway across the bottom of the screen with a Mine Guardian at each end.

In the top right will be an open space containing a man and a number telling you whether he is miner 1, 2 or 3.

You move your man using the arrow keys, plus those between them for diagonal movement. He collects a jewel by dropping onto it and must then return to the open space above.

Whatever the result, the course is reset and you may then try for the next jewel.

If your man successfully recovers all three jewels, you will be given a score and asked if you wish to play again. You will be given the same option if your man fails to survive but, of coruse, there will be no score.

The game can be made easier or more difficult by changing certain values:

390 if the numeric value 1 16 is increased more rocks will appear, up to a maximum of 15 per line

570 if the limit value of the FOR-NEXT loop is increased more men will be available

1060-1080 the ASCII codes for the counter numbers could be changed to give more or less time

2010 if the numeric value 1 14 is decreased the lasers me less likely to fire and the opposite is also true

2110 changing the figure 1 16 will increase or decrease the likelihood of hammers dropping

Here are a couple of points of interest about the program.

TI BASIC does not support AND/OR statements. However, these can be initiated by enclosing the relational expressions in brackets and using the plus sign for OR and the multiplication sign for AND, as in line 1500 (AND) or in line 1480 (OR).

In lines 1300 and 1310 the new values of I and J are calculated thus: the expressions in brackets — for example (KK=69 — will be given a value of zero if they are false or a value of minus one if they are true.

Consequently, adding all these values together, then adding them to the values of Y and X gives new values for I and J.

Variables

In the interest of saving memory, several variables are used for different purposes.

N controls several FOR-NEXT loops return variable for CHAR statements, to detect mine shafts walls and in timer operating loop

Z is used in several FOR-NEXT loops, counter in building array holding rocks and in displaying rocks, row number in DISPLAY AT sub-routine

HT holds best (lowest) score

I/J row/column position when displaying rocks or new row/column position when moving man

Y/X old row/column position when moving man

MN number of men

Q start column location in DISPLAY AT sub routine

JE number of jewels "in transit"

RK return variable in CHAR statement to detect rock above man's new position

MAN holds ASCII code of man moving left or right

TT score in current game

KK holds ASCII code of key pressed

SS status variable, detects whether key was pressed in CALL KEY statement

P holds ASCII code of space man will leave behind

RV/RH vertical/horizontal locations of a rock above man's new position

WS string variable to hold character code in READ statement, or holds message in DISPLAY AT sub-routine

R(316), S(6,3), G(3,2) array holding positions of rocks, mine shafts, jewels

Hints on coversion

Conversion should not be too difficult on any home computer allowing user defined characters. Here are explanations of some commands in TI BASIC, all prefaced by the word CALL:

CLEAR equivalent to CLS, places space character in all screen positions

SCREEN changes screen colour according to colour code

CHAR re-defines the standard ASCII characters according to a 16-place hexadecimal string code

COLOR sets colour of the character group in the format (character group, foreground colour, background colour)

HCHAR positions character and optionally repeats it horizontally in the format (row number, column number, ASCII code, number of repetitions)

VCHAR as for HCHAR, but repetition is vertically

GCHAR takes the format (row number, column number return variable) and places the ASCII code of the character found in the specified position in the return variable

KEY places ASCII code of key pressed in the key variable, takes the format (key unit, key variable, status variable) where status variable indicates whether or not a key was pressed

SOUND takes the format (duration, frequency, volume) where the duration is in milliseconds, frequency ranges from 110 to 4473 Hz, volume is 0-30 (1 a -ve frequency (1 to -8) is specified 1 "white noise" is produced if a -ve duration is specified, an immediate sound update is carried out when the next CALL SOUND statement is encountered. Optionally, up to three frequencies and volumes may be specified in one CALL SOUND statement to produce chords.

The TI 99/4A uses a screen display of 24 vertical by 32 horizontal in the graphics mode and 24x28 when printing words. Each square is further divided into an 8x8 matrix which is used for defining the characters.

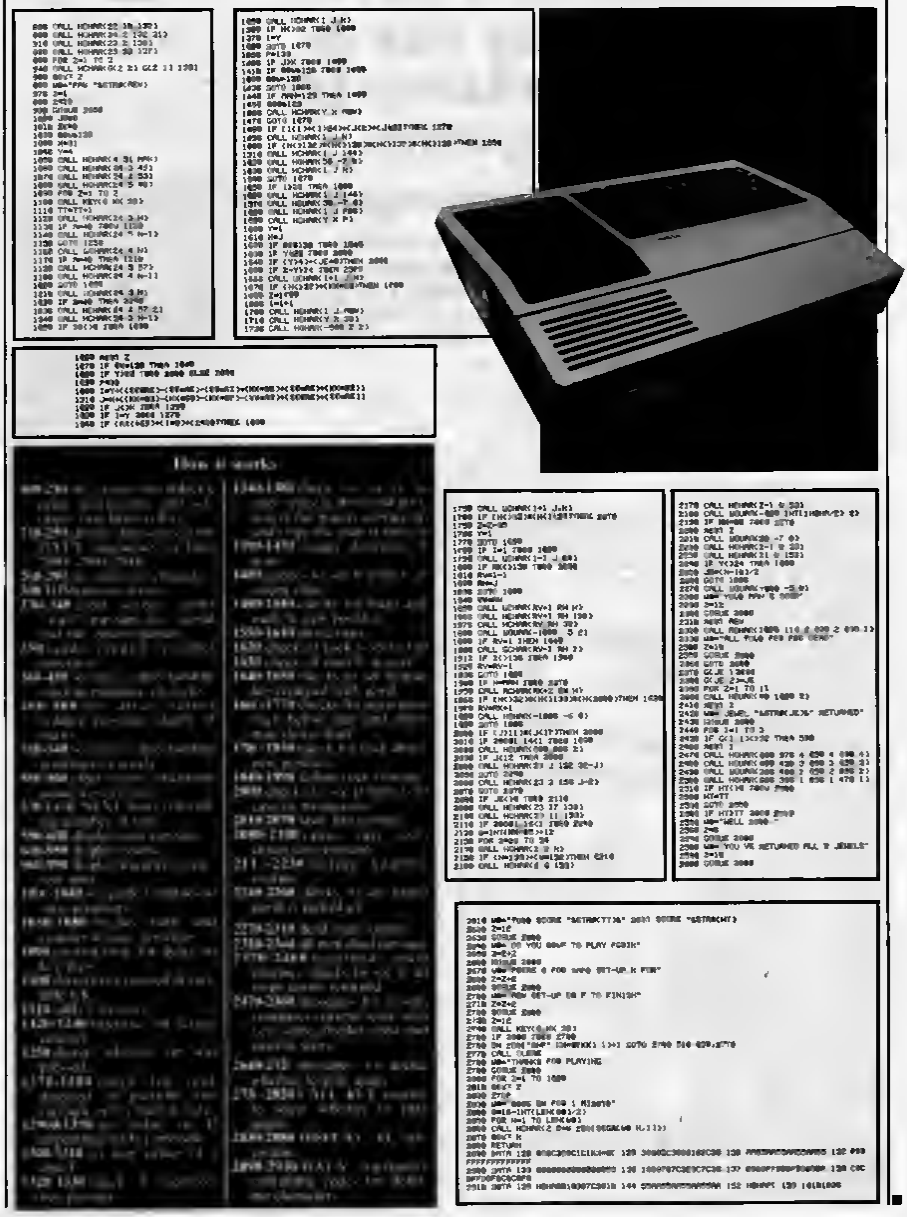
(KK 69) — will be given a value of zero if they are false or a value of minus one if they are true.

```
89 REM  JEWEL MINING
90 REM  BY JAMES WILSON
91 REM
100 CALL SCREEN(2)
110 PRINT TAB(9);"JEWEL MINING": TAB(9);"----------"
120 PRINT "  YOU MOVE THROUGH MEN TO DIG"  " ENTER TO THE MOVE BELOW"
130 PRINT "  AND RETURN THE ENTER"  " MOVE AND AT A TIME"
140 PRINT TAB(9); "TO THE SURFACE"  " BEWARE OF FALLING ROCKS AND"
150 PRINT "  SWINGING THE MINE GUARDIANS"  " AND THE OPEN MINE SHAFTS"
160 PRINT "  AND IT LET THE TIMER RUN "  " TO ZERO OR YOU WILL DIE"
170 PRINT " USE ARROW KEYS E S D X C TO"  " MOVE THE MAN LEFT RIGHT "
180 PRINT "  UP MOVE ARE DIAGONALLY"  " MOVE OR FIRE AND MINUTE"
```

```
130 FOR N=1 TO 8
200 CALL COLOR(N 19 2)
210 NEXT N
220 FOR N=1 TO 12
230 MOVE Z 48
240 CALL SOUND(2 480)
250 NEXT N
260 CALL VCHAR(13 15 83)
270 CALL VCHAR(14 9 21)
280 CALL VCHAR(19 14 15)
290 CALL VCHAR(18,4 93)
300 CH RC(83) RC2 83 RC3 83
310 MT=0
320 MOVE 200
330 CALL CLEAR
340 SOUND 2000
350 RANDOMIZE
360 Z=1
370 FOR I=1 TO 81
380 FOR J=2 TO 30
390 IF RND<.1&I THEN 530
400 R(Z)=J+(I-1)*32
410 Z=Z+1
420 IF Z>315 THEN 540
430 NEXT J
440 NEXT I
450 RC3(0)=0
460 FOR I=1 TO 6
470 X=I-1*INT(RND*14)+1
480 X=X-1*INT(RND*3)+3
490 X=X-1*INT(RND*3)+3
500 NEXT I
510 FOR I=1 TO 3
520 X=I-1*INT(RND*10)+10
530 X=X-1*30
```

```
540 REM 2
550 TT=0
560 CALL CLEAR
570 FOR REM=1 TO 3
580 IF REM=1 THEN 610
590 TT=0
600 SOUND 2000
610 CALL HCHAR(1 1 128,784)
620 CALL HCHAR(1 1 30,24)
630 CALL HCHAR(23 9 128 30)
640 Z=1
650 FOR I=1 TO 31
660 IF ZMOD(8)=0 THEN 730
670 J=R(Z)+(I-1)*32
680 IF J>32 THEN 700
690 CALL HCHAR(I J 128)
700 Z=Z+1
710 GOTO 800
720 NEXT I
730 FOR I=1 TO 6
740 CALL HCHAR(RC2 13-RC2 2 28,RC2 31)
750 NEXT I
760 CALL HCHAR(5 32 32 9)
770 CALL HCHAR(1 31 38 103)
780 CALL HCHAR(12 10 32 10)
790 FOR I=1 TO 6
800 CALL HCHAR(I I+7 32 29-(I*2))
810 NEXT I
820 CALL HCHAR(22 11 132 5)
830 CALL HCHAR(22 12 133 5)
840 CALL HCHAR(22 13 32 5)
850 CALL HCHAR(23 10 32 5)
860 CALL HCHAR(24 11 130 3)
870 CALL HCHAR(24 12 131 3)
880 CALL HCHAR(23 10 128)
```

TI-99/4A PROGRAM



Games to take home to the range

Our reviewers put on their Stetsons and tell you pardners about some Texas games on cassette and cartridge

Invasion TI-99/4A £5

Stainless Software, 10 Alstone Road, Stockport, Cheshire, SK4 5AH

Here you have the task of single-handedly defending your island from landing parties of enemy ships. The display on screen shows the coastline and your gun, which is strategically placed near the bottom in a bay.

The invasion force appears, one at a time, to the left of the screen and travel horizontally towards the shore.

Using keyboard controls to move and fire, your gun is placed so as to blast each ship as it passes. When one is hit, however, it leaves a shipwreck which forms a barrier to any further gunfire.

As the game progresses and more ships are destroyed direct hits become increasingly difficult. Should a ship land on your island the width of the bay in which your gun is placed becomes narrower. The game ends when either you accidentally crash into the bay or complete invasion is accomplished.

A simple yet enjoyable game well crashproofed and with some pleasing graphics, but it is one which you can never actually win.

The only goal is to achieve the highest score possible before you are ultimately stopped. Some comment on your performance at the end of each run might well make this more motivating. J W

instructions	80%
playability	60%
graphics	80%
value for money	80%

★ ★ ★

Hen House TI-99/4A £27.95 (cartridge)

Galaxy, 60 High Street, Maidstone, Kent

The player controls, using keyboard or joystick, a farmer who has two conflicting tasks — to catch eggs falling from a hen house and place them in a truck, while also shooting poachers and foxes (and the odd bird).

Points are scored for each bird or poacher shot, and the game ends when six eggs have been dropped. The pace of the game speeds up as you go along, but there is only one scenario: this could give the game limited playability.

Instructions are far too brief but adequate if you don't mind a little experimentation. You pick the gun up and drop it by moving to screen left, and put the eggs on the lorry by moving to screen right.

The graphics are quite good, especially the animation of the farmer. S S

instructions	40%
playability	30%
graphics	80%
value for money	60%

★ ★ ★

Torpedo Alley/ Ascot Stakes TI-99/4A (Extended BASIC) £8.00

Lantern Software, 4 Haffenden Road, Tenterden TN30 6QD

Simple spelling mistakes in the instructions for both programs do little to improve them. While excellent use is made of graphics, interest is not sustained, and skill requirements are negligible (or absent in the case of Ascot Stakes).

Torpedo Alley has you launching two torpedoes simultaneously at three ships running the gauntlet between the rocks at night. Only two degrees of difficulty are offered — easy or hard — the difference lying mainly in the game tempo.

The score is displayed as the 'time' counts up to 120. The game might well appeal to the very young or to those with poor hand-eye co-ordination.

Ascot Stakes is graphically excellent, producing a television type pan of the race, but there is no skill involved at all. Punters select their horses, place their bets (you start with £100) and the computer does the rest.

You play until either all punters are broke or want to give up — you can't stop unless everybody else wants to!

This game is likely to appeal to only the very young. Although providing two programs for the price, the cost is still very high. P B

instructions	75%
playability	30%
graphics	90%
value for money	30%

★ ★

Core TI-99/4A £5.50

Christine Computing, 6 Florence Close, Watford, Herts

Hidden deep in the earth is the core. To reach it you have to complete all three stages of this game. Firstly your craft descends through clouds, birds and aeroplanes and you have to navigate a clear path.

Secondly, after successfully through the sky you go underground negotiating the cave and caverns.

It takes a little while to realise that there is only one way through but if you complete this the third part looms up and all that stands between you and the core is the 3D maze.

After a number of frustrating attempts you should reach the core. A little light hearted relief will be found here.

If you collide with any part of the scenery your score and the highest so far is displayed along with an invite to play again but no score is given for a successful mission.

Each new game is the same as the last, so once you have reached the core a few times there is very little incentive to play again.

I had no problem in loading that game and found the screen instructions clear, although the spelling of the word 'plains' for planes was a little ambiguous.

The graphics are neat but colour would enhance the game. C.E.

instructions	85%
playability	50%
graphics	50%
value for money	50%

★ ★ ★

Rabbit Trail TI-99/4A £27.95 (cartridge)

Galaxy, 60 High Street, Maidstone, Kent

The screen shows a rabbit run. You are the bunny — very nice graphics here. You must hop along your rabbit run collecting carrots and avoiding some nasty creatures that seem to like rabbits.

The screen display seems to be a rabbit warren, but on the basis that hawks don't usually fly underground, I assume it must be meant to be a rabbit run, or a series of runs connected by tunnels.

There are seven screens to try your hand at, and the game is against the clock.

Graphics are good, and the game scores highly for originality and lack of violence (provided you avoid the predators).

Enjoyable. But owners of the 99/4 should note that this module will only run on the 99/4A! S S

instructions	50%
playability	80%
graphics	95%
value for money	80%

★ ★ ★ ★

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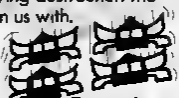

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EXPORT ENQUIRES WELCOME

Space hazards come in all shapes and sizes

Packed with action and several varieties of danger, Richard Gibbs' program for the Commodore 64 offers a real challenge. There are up to 31 skill levels

How it works

1-8 set up variables
9 reads sprite data
11-148 sprite data
150-270 introduction
290-560 rocket attack
570-770 refuelling stage
800-985 lunar landing scene
1000-3040 alien attack
3100-3113 explosion 1
3200-4095 mothership pickup
5000-5104 end message titles
5100-5104 explosion 2
5200-5310 high scoring
7000-7040 explosion 3
7100-7140 red alert sound
10000-10030 introduction sound

Alien Attack is a BASIC program using the Commodore 64's sound and low res graphics to the full.

Fundamentally the game falls into the blast'em and beat'am format with an interesting variety of space scenarios.

There are a potential 31 levels of skill available — all determined by the player using the F1 function key as the game titles are first displayed. Don't be over-ambitious — you may survive the first section but the difficulty level remains with you.

Stages of play are.

1 Introduction titles — note sprite letters

2 Music from the Planets — not Holst, to be sure, but he didn't have to PEEK and POKE every note!

Pressing the space bar appropriately commits you to the game. Attack sirens wail and you exit from hyperspace to withstand a head-on onslaught.

3 Twirling rockets — evade the rocket using a joystick in port 1 or keyboard
CTRL left
2 right
left arrow down
1 up

4 Refuelling. Having survived the rockets you can attempt to dock at the vintage fuel station to recharge your lithium fuel banks.

Use your steering to manoeuvre, but be aware that doing so could leave you stranded. When you dock with the pump autofill will commence with the

Hints on conversion

Due to the extensive use of sprites and user defined graphics, which are both powerful tools of the Commodore 64, conversion to any other micro could prove very difficult.

Perhaps the VIC 20, with its similar graphics facilities could use the bulk of the program to produce a screen display similar in principle, but in the absence of the 64's excellent sprite abilities spaceship and aliens would present insurmountable obstacles.

Quite simply, unless sprites or similar are available on your micro the best advice is to save up your money and invest in the best!

Variables

VO,WA,H,LO,AT,SU voice 1 sound registers
X, X1, X2, X3, Y, Y1, Y2, Y3 sprites' x,y locations
HS,HS high score variables
DP,SO value of high note
WF, WQ values for voice waveforms
DI,MO direction of spaceship movement
AB$ ACS variables to print the tractor beam
HI number of hits on the alien's craft
SP number of alien spacecraft destroyed
T amount of fuel spacecraft has left
SC score
FG sprite 1 location pointer
BU tests if laser has been fired
JV value of the joystick (direction)
RS rocket speed and level of play
V VIC chip register

energy transfer making your ship pulse with trapped radiation

5 Now that you have fuel you journey to the rendezvous asteriod to pass on the information you have gathered — the aliens heve forseen the possibility of you going there and have planted floating mines, one of which is programmed to move up and down towards the surface to restrict access to the only landing site on the whole asteroid

You can sideslip between the mines or power in from the sides using more fuel Joystick fire button or keybaord space bar give you a boost facility — be sparing on its use

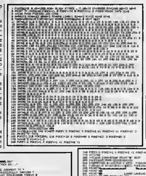
Warning. You must land in the centre of the pad to survive the impact.

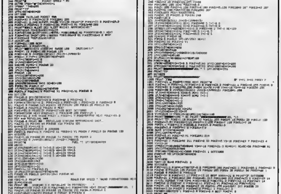
6 Alien Attack. Typically, just when you think you are safe another phase begins Alien kamikaze squads plunge down at you — their merest touch will destroy you Your cannon is in auto-fire and by moving left and right you discover that eight hits on their ships causes them to explode into fragments.

The number of these attackers was set by you when you selected game level at the beginning — you only have yourself to blame if you fail now!

7 At last you succeed — when you landed your home phone rang your mum and here she comes in her mothership Down comes the tractor beam Slip into the beam and away you go

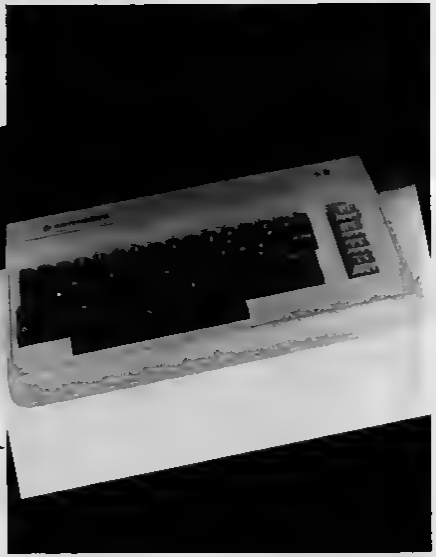
If you make it or even if you fail along the way there is a possibility that you have achieved the high score If this is the case another sound experience unfolds Enter your name for immortality well at least until bedtime Happy zapping!





COMMODORE 64 PROGRAM

```
3600 FOR=15TO0STEP-2 POKE+7 8 POKE+1,8 POKE+7 8 NEXT
3610 PRINT"CP POKE+21 0
3611 GOTO3000
3620 GOTO4000
3800 PRINT"@  ENTER THE TRACTION 0000 FULLY   "
3801 DETA0 Y3=0
3900 IFA+"OFTHEN4+40-1
4005 IFA+ 2 THEN3+3+1
4010 IFX>254THENX=255
4015 IFX<25THENX=0
4020 IFX>179THENFOR=Y3TO900STEP-8 2 POKE+7 8 NEXTA GOTO4000
4070 POKE+4,X1 POKE+7 Y3
4090 GOTO4001
4000 PRINT"
4001 FOR=A TO10 PRINTNEXT NEXT
4070 POKE+ 15 POKE+1 56 FOR=8TO0STEP-8 3 POKE+8,8 POKE+8 8 POKE+7 8
4080 POKE+ 0 POKE+7 2 POKE+21 30 POKE+7 30 PRINT
4090 GOTO5000
4100 PRINT"@                 YOUR FUEL SUPPLY ERE OUT!!                  " FOR=8TO5000 NEXT
4200 POKE+7 8 PRINT"CP POKE+21 0 IFRC>10THENN=RC GOTO2000
4810 PRINT"                 TH YOUR MISSION YOU MANAGED TO " PRINT
4820 PRINT" SCORE  50-"  "BTHE HIGH SCORE IS  HA PRINT
4840 PRINT"BTHE HOLDER OF THE HIGH SCORE IS  PRINT PRINT"          "/A00
4850 PRINT PRINT"@          PEASE PRPCEE TO PLAY"
5000 RETURN
5065 IFRC>0  THEN5000
5070 POKE250 0 SCH= HI=0 GP=0 POKE+,0 POKEN 0 POKEN 0 POKE+7 0
5080 RE31.0% PRINT"Z                                    PLEASE WAIT  GOTO5
5100 POKE+21 2 POKE+1,100STEP-8 2 POKE+41 255 POKE+23 2 POKE+29 2
5101 POKE+23 0 POKE+25 V POKE+46 1
5102 POKE+ 0 POKE+1 128 POKE+37 POKEBJ (25 POKE+ 28 POKEJ) 00
5102 POKE+5 0 POKEN 0 POKEJ 0 NEXT
5104 GOTO5000
5200 PRINT"CP POKE+ 15 POKEN 30 POKEJ 255
5201 POKE+7+2 30 POKE+14 30 POKE+7 255 POKE+14 255 POKE+7 30
5300 POKE+14,32 POKE+ 33 FOR=0TO0STEP-2 POKE+7 8 POKE+14 6
5310 POKE+ 8-INT(X/256)*256 POKE+7 8 POKE+14 6
5320 PRINT"Bbbbbb HIGH SCORE ***** HIGH SCORE ******"
5330 NEXTA POKE+0 0 PRINT"CP
5370 INPUT"ENTER NAME FOR HIGH SCORE" A$0
5380 IFLEN(A$)>15THEN4A$=LEFT$(A$0 15)
5510 RETURN
7000 FOR=14000STEP-8 2 POKE+1 255 POKE+25 2 POKE+29 0 POKE+23 0 POKE+29 (
7010 POKE+7 8 POKE+ 125 POKEJ 20 POKEN 20 POKEJ 30 POKE+40 1
7500 POKE+ 8 POKEN 0 POKEJ 0 NEXT
7504 POKE+23 2 POKE+25 2 V1=0 POKE+2 V1 POKE+41 200 POKE+ 19
7500 H1=0 SP=0 V1 SCH0=0 RETURN
7100 POKE+ 15 POKEN 36 POKE+7 30 POKEBJ 255 POKE3U7 255 POKE+ 30
7110 POKE+7 33 POKE+14 33 POKE+14 30 POKE3U14 255
7120 POKE+1100 POKE3U81 8 POKE+41000 POKEN 0 POKEN7 0 POKE+14 0 NEXTA NEXTA
7140 POKE+7 8 POKE+14 8 POKE+ 0 POKE3U81 0 RETURN
10000 POKE+7 30 POKE+7 33 POKE+14 33 POKE+7 255 POKE+7 255 POKE+14 255 "
10001 POKE+ 15
10010 POKE+ 30 POKE+7 33 POKE+14 30
10020 FOR=8TO00 @@@@@(1)@C7-3)+3 POKE+ 8 POKE+7 8 POKE+14 0 POKEJ,0
14000 FOR=8TO100 NEXTC NEXTA RETURN
```



Games of the unexpected

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Games off the beaten track

If you're feeling space sick, you don't have to miss the action

Danger UXB BBC B £7.95

Program Power, 8/8a Regent Street, Chapel Allerton, Leeds LS7 4PE

This is a good version of an unusual game which I have seen only rarely in arcades but which is most enjoyable to play, and uses the BBC sound effects to the full

You are a small nondescript figure in the centre of a grid of blue squares, populated by skulls, bonus flags and ticking time bombs

The object is to defuse these bombs by running over them, while avoiding the lethal skulls. Should a bomb blow up before you reach it, a life is lost

Sounds easy? Here's the catch You can only step on a square once, and it disappears, leaving a space which cannot be passed You must use the slide control which moves an entire row of squares sideways and creates new pathways

The flags can be run over for bonus points, and at the end of each 'phase', you get the chance of more bonus points by dropping your man onto a special flag surrounded by skulls

After this the game speeds up until you have only seconds to defuse bombs Also available as an option are 'stamping boots' which chase you round the grid and you can alter the time delay on the bombs

I particularly liked the sound on this game and the range of optional features, but I suspect that the novelty would eventually wear off after a few long sessions

D.A.

instructions	80%
playability	80%
graphics	70%
value for money	66%

★ ★ ★

Shadowfax Commodore 64 £7.99

Postern, PO Box 2, Andoversford, Cheltenham, Glos GL54 5SW

The instructions describe Shadowfax as a 'real time adventure' game but the game controls are more appropriate to an arcade offering

But on loading it turned out to be a sort of mad Donkey Derby You are riding in one direction while about six horses ride towards you

The object of the game is to avoid touching another horse To score points you must zap the enemy horses by firing a thunderbolt at them

You move up and down the screen while the background and enemy horses scroll from left to right The graphics give a 3-D effect with you moving both under and over the background The galloping sounds used are very realistic and complement the screen display

Either the joystick or the keyboard can be used to control your movements The controls are fairly easy to handle and should cause no difficulties

The program does have one fault — it gets boring and repetitive quite quickly

K L

instructions	10%
playability	80%
graphics	95%
value for money	65%

★ ★ ★

Lusitanic Dragan £4.95

Coppice Software 7 March Street, Kirton in Lindsey, Gainsborough, Lincs DN21 4PH

No instructions at all were provided with my review copy of Lusitanic, but I understand that instructions will be given with retail versions

There are two programs on the tape both of which must be loaded The main program starts with a nicely done graphic representation of an ocean liner

This apparently strikes a rock and the picture changes to show the side of the liner, a desert island and a motor boat At least I think it is a motor boat but it maybe a floating trampoline

The hopeful survivors leap from the side of the ship and by moving the motor boat you enable them to bounce from it over the water to the island Each man rescued scores a point

If you fail the man lands in the water and after three deaths by drowning the game is over The highest score and current score are displayed and you are asked if you wish to play again

It sounds simple, and so it would be if only one man jumped at a time, but they are impatient and the number and frequency varies At one time I had five men trying to reach the island at the same time needless to say they did not all make it

This game probably won't make the best sellers list but I found it amusing using both joystick and keys

J M

instructions	10%
playability	70%
graphics	80%
value for money	80%

★ ★ ★ ★

Jungle Fever 48K Spectrum £6.90

A & F, 830 Hyde Road, Manchester M18 7JD

A superb game in which you control a walking, jumping and if you're not too careful, falling figure through waterfalls, across pits over spiders etc

Excellent playability and multi level structure, in which all is never quite revealed, kept me glued to the keyboard for many hours

Initially, I thought that swinging across the pit on a rope was totally impossible (and when you've got on the rope — getting off is a whole new ball game), but your intrepid reviewer did it in the end, only to be confronted by those orrible leg gnashing spiders

As you progress up the levels, the hazards combine in new and more terrible ways

I got to the lethal combination of pygmies, waterfalls, spiders and arrows and was doing quite nicely until an arrow punctured my cranium from behind Ah well!

M B

instructions	60%
playability	98%
graphics	98%
value for money	95%

★ ★ ★ ★ ★

Manic Miner 48K Spectrum £5.95

Bug-Byte Mulberry House, Canning Place, Liverpool L1 8JB

This game starts with a pleasant view of a house in downtown Surbiton, accompanied by a pleasant rendering of The Skaters Waltz After a few bars of this merry little tune, the control keys are displayed, and the computer goes into demo mode

You can choose whether you want to watch this or play the game The demo will show you every cavern your miner has to explore, this time to the accompaniment of another old favourite, Hall of the Mountain King

I'm not sure what Grieg would have thought about one of his works being used as the background to a video game, but you have to hand it to them — it's very clever

Each of the 20 caverns contains danger in many different forms Platforms you jump on to crumble under your feet, there are poisonous plants, stalactites and various creatures which try to foil your plan of grabbin' the cash

All the things you will meet are very strange and weird There are robots, penguins performing seals, Pac people, mutant telephones, Humpties and toilets (yes, toilets, with seals a flapping)

N B

instructions	85%
playability	100%
graphics	100%
value for money	100%

★ ★ ★ ★ ★

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Can you dig it?

Grab the diamonds and tunnel for your life in William Bailey's Digger game for the Oric-1

Hints on conversion

PLOT AT in Oric BASIC is equivalent to PRINT AT in most other BASICs.

The Oric uses parallel attributes where most others use serial attributes.

The Oric plots colour at the stated coordinates for the rest of that line unless another PLOT statement is used.

The colour codes used in the program are as follows: For foreground, 1 red, 2 green, 3 yellow, 4 blue, 5 magenta, 6 cyan, 7 white. 0 black. For background 17 red, 18 green, 19 yellow, 20 blue, 21 magenta, 22 cyan, 24 black.

The program runs in just over 8K.

There's diamonds in them there tunnels — but there's also a hungry monster guarding them.

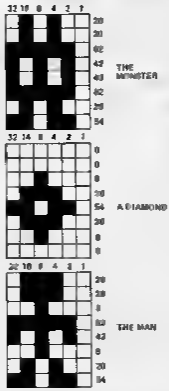
To get the monster to drop the diamonds, you have to tempt him to drop them by making him chase you underground. Being very short sighted, he will inevitably drop a few, and your fuel level goes up each time you can get to the diamonds and pick them up before he does. Pink diamonds score 15 fuel units and red diamonds score 10.

The screen is divided into three areas: yellow, above ground; pink, just below the surface; and red, deep under ground.

The monster can only dig passages in the pink area because he cannot see well enough in the deeper level. In the red area, he will therefore have to follow the tunnels you dig.

Whenever you tunnel into the ground, you lose two units of fuel, and whenever you are underground but not digging you lose one unit of fuel. If fuel is less than 50 units, you will hear a warning "ping" telling you to refuel or die.

You have five lives, but if fuel reaches zero then the game is over no matter how many lives you have.



USER DEFINED CHARACTERS

%	1st GROUND LAYER (PINK)
!	2nd GROUND LAYER (RED)
@	MONSTER
#	MAN
&	DIAMOND

TO CHANGE THE USER DEFINED CHARACTERS ALL YOU NEED DO IS CHANGE THE VALUES IN LINES 1010 - 1030

```
1 S$="":Z$=""
2 INK4:PAPER0
3 LV=5
4 SCO=0
5 SK=0
6 FORF=46592TO46599:READW:POKEF,W:NEXTF
7 FORF=46384TO46391:READW:POKEF,W:NEXTF
8 FORF=46376    TO46383:POKEF,63:NEXTF
9 FORF=46366TO46367:READW:POKEF,W:NEXTF
10 FORF=46344TO46351:POKEF,63:NEXTF
15 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
16 FORF=5TO9
17 PRINT"|xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxx|"
18 NEXTF
21 FORF=18TO25
22 PRINT"|!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!"
23 NEXTF
24 L$="":IFLV=1THEN26
25 FORQ=2TOLV:L$=L$+"# ":NEXTQ
26 PLOT30,8,L$:PLOT29,0,4
30 PING
40 F=200
50 X=4:Y=36
51 MX=4:MY=2
90 PLOTY,X," ":PLOTMY,MX," ":IFRND(1)>.8
5ANDMX>4THENPLOTMY,MX,"&"
91 IFF<100THENPLOT1,0,"                    ":WAI
T10:IFF<50THENPING
92 PLOT1,0,"FUEL          ":PLOT6,0,STR$(F)
```

How it works

1-5 sets variables
6-10 defines the characters
16-18 draws four lines of %
21-23 draws 15 lines of !
24-30 prints out the screen number of lives left
40-50 sets remaining variables
90-94 checks fuel, and if necessary warns the player by pinging if fuel is low
95-96 plots the colour on to the screen
97 prints score
98 plots more colours
99-104 monster moves
105-114 you move
120-122 increases score and fuel if you pick up a diamond
123-125 plots diamonds you have picked up on the screen, and if need be clears the screen for new diamonds
126-131 plots the diamonds' col our on to the screen
150 plots you and monster on screen
160 jumps to 500 if you've been eaten
165 jumps to 400 if you run out of fuel
200 loops back to line 90
500 checks to see if you have any lives left. If not, jumps to 550
510-540 deducts one life, emits zap and jumps to line 15
560-610 end routine
1010-1030 data for characters. Remember that the Oric uses an eight by six, not an eight by eight grid to define characters
Note: to show the monster and man more clearly, then add this to your program
151 WAIT 10
To load, enter
CLOAD "DIGGER"

```
93 IFF>100THENI=2
94 IFF<10ITHENI=1
95 FORN=10TO24:PLOT0,N,1:NEXTN
96 FORN=5 TO9 :PLOT0,N,5:NEXTN
97 PLOT15,2,"SCORE ":PLOT21,0,STR$(SCO+S
K )
98 PLOT0,0,I :PLOT1,4,19:PLOT30,4,16:PLO
T0,25,2
99 IFINT(RND(1)*2)=1ANDMX<>XTHEN103
100 IFMY<36ANDMY<YANDSCRN(MY+1,MX)<>33TH
ENMY=MY+1:PLAY1,2,1,5
101 IFMY>2ANDMY>YANDSCRN(MY-1,MX)<>33 TN
ENMY=MY-1:PLAY1,2,1,5
102 GOTO106
103 IFMX<36ANDMX<XANDSCRN(MY,MX+1)<>33TN
ENMX=MX+1:PLAY1,2,1,5
104 IFMX>4ANDMX>XANDSCRN(MY,MX-1)<>33THE
NMX=MX-1:PLAY1,2,1,5
106 D$=KEY$:IFD$=>CHR$(8)ANDD$<=CHR$(11)
THENK$=D$
109 IFK$=CHR$(9)ANDSCRN(Y+1,X) >32ANDY<3
6THENF=F-1:PLAY1,2,2,100
110 IFK$=CHR$(10)ANDSCRN(Y,X+1) >32ANDX<
24THENF=F-1:PLAY1,2,2,100
111 IFK$=CHR$(11)ANDSCRN(Y,X-1) >32ANDX>
4THENF=F-1:PLAY1,2,2,100
112 IFK$=CHR$(8)ANDSCRN(Y-1,X) >32ANDY>2
THENF=F-1:PLAY1,2,2,100
114 IFK$=CHR$(10)ANDX<24THENX=X+1
115 IFK$=CHR$(11)ANDX>4 THENX=X-1
116 IFK$=CHR$(8)ANDY>2THENY=Y-1
117 IFK$=CHR$(9)ANDY<36THENY=Y+1
118 IFX>4THENF=F-1
120 IFSCRN(Y,X)=38THENF=F+10:IFX<10THENF
=F+10
121 IFSCRN(Y,X)=38THENS$=S$+"& " :PLAY2,
3,2,500:SCO=SCO+1
122 IFSCO=20THENSK=SK+20:SCO=0:S$=" "
123 PLOT1,1,"
                    "
124 PLAY0,0,0,0
125 PLOT1,1 ,S$
126 IFSK=0THENPLOT0,1,4
127 IFSK=20THENPLOT0,1,6
128 IFSK=40THENPLOT0,1,2
129 IFSK=60THENPLOT0,1,3
130 IFSK=80THENPLOT0,1,5
131 IFSK=100THENPLOT0,1,1
140 PLAY0,0,0,0
150 PLOTY,X,"#":PLOTMY,MX,"@"
160 IFMX=XANDMY=YTHEN500
165 IFF<=0TNEN600
200 GOTO90
500 IFLU=1THEN550
510 LU=LU-1
520 ZAP
540 GOTO15
550 PLOT10,5,"**GAME OVER**":PLOT5,5,2
560 EXPLODE
570 PLOT23,5,5
580 GOTO570
600 PLOT10,5,"++OUT OF FUEL++":PLOT9,5,1
602 EXPLODE
605 PLOT24,5,5
610 GOTO610
1010 DATA20,20,62,42,42,62,28,54
1020 DATA0,0,8,28,54,28,8,0
1030 DATA28,28,8,62,42,8,20,54
```

Your Dragon's characters and how to invert them

Why does the Dragon go to the trouble of converting ASCII codes into others? David Gray shows how they are used for inverse characters

Like most microcomputers, the Dragon uses a modified version of the ASCII character set to represent characters.

The main differences between the Dragon character set and standard ASCII characters are as follows.

- The ASCII lower case letter codes (97 to 122) are displayed as uppercase letters in inverse video.
- There are no ASCII characters with codes in the range 128 to 255. On the Dragon these codes represent graphics characters.
- Various other ASCII character codes are displayed differently — see table 1.

The following small program will display the characters with codes in the range 32 to 255

```
10 CLS
20 FOR I = 32 TO 255
30 PRINT  " ",CHR$(I),
40 NEXT I
50 END
```

With the ASCII character set the codes between 0 and 31 represents control characters, i.e. characters which are not displayed but which are designed to have some effect on the device receiving them. For example code 7 is BEL and normally a device receiving this code will emit (bell) sound.

The following program can be used to see the effects (if any) these codes have on the Dragon.

```
10 CLS
20 FOR I = 0 TO 31
30 PRINT I;"HO";CHR$(I);"RD"
40 IF INKEY$ = "" THEN 40
50 NEXT I
60 END
```

If a code has no effect then the PRINT statement in line 30 will display the code followed by WORD, i.e. the character between O and R is ignored. Executing this program reveals that only the codes 7 (BS) and 13 (CR) affect the DRAGON.

Back space (BS) causes the computer to move back a position on the screen before printing and thus WORD comes out as WRD. Carriage Return (CR) causes the computer to take a new line.

The memory map of the Dragon indicates that character codes for the characters currently displayed on the screen are held in locations 1024 to 1535, i.e. one byte for each position on the screen. However, examining the contents for these locations reveals that the ASCII codes are not used.

The following program places a code in a fixed position using CHR$ and then uses PEEK to inspect the value held in the display memory.

```
10 CLS
20 INPUT  "CODE PLEASE";X
30 IF X<0  OR  X>255  THEN PRINT   PRINT "INVALID CODE "   GOTO 20
40 CLS
50 PRINT @512,CHR$(X)    REM PUT CODE IN NEXT TO LAST POSITION ON SCREEN
60 Y = PEEK(1534)    REM LOOK AT CODE STORED IN LAST BUT ONE BYTE OF SCREEN
     MEMORY.
70 PRINT 20 "CODE INSERTED = ";X
80 PRINT 064 "CODE PEEKED = ";Y
90 PRINT @128 "PRESS ANY KEY TO CONTINUE ";
100 IF INKEY$ = "" THEN 100 ELSE 10
```

Using this program we can see that the BASIC interpreter is translating ASCII codes into codes acceptable to the hardware driving the screen.

In the case of CR and BS the interpreter does not actually place a value in memory but just uses the information to decide where to put the next character.

Why go to all this trouble?

The answer is simple. Since the normal ASCII characters represented by codes 0 to 31 are not used in the display memory, these extra codes can be used to supply extra characters. Having these extra codes allows inverses of the characters space to ? (codes 32 to 63), which are not normally available in BASIC.

The following program displays all the available non-graphics characters by POKEing values directly into memory.

```
10 CLS
20 P = 1152
30 FOR I = 0 TO 127
40 POKE P,I
50 P = P+1
60 NEXT I
70 END
```

From the output of this program we can see that the codes 0 to 63 represent inverse video characters and codes 64 to 127 represent the normal characters. We can also see that they are not in the same order as the normal ASCII characters.

We can also see that there is a simple relationship between the code of a non-graphics character and the code of its inverse. Given a normal character with code N then its inverse has code N-64. The following BASIC subroutine uses this relationship to invert a screen image.

```
3000 REM INVERT SCREEN
3010 FOR P = 1024 TO 1535
3020 K = PEEK(P)
3030 IF K>63 THEN K = K-64 ELSE K = K+64
3040 POKE P,K
3050 NEXT P
3060 RETURN
```

The following program uses this subroutine to continually invert a screen image.

```
10 GOSUB 3000   GOTO 10
```

This subroutine has two significant disadvantages. It is very slow (about eight seconds to invert a screen) and it does not work on graphics characters.

However, using the same principles it is possible to write a machine code subroutine to solve these problems. The following program inserts such a machine code subroutine into memory locations 32745 to 32767.

```
10 CLEAR 500,32744
100 FOR P = 32745 TO 32767
110 READ A$
120 PRINT P;VAL("&H"+A$)
130 NEXT P
140 END
150 DATA 8E,04,00,A6,84,81,7F,22,
02,8A,40,A7,80,8C,05,FF,
23,F1,39
```

This subroutine can be executed by using EXEC 32745. It takes about a fiftieth of a second to execute and can be placed anywhere in memory if necessary.

The following program demonstrates the use of this subroutine.

```
10 CLS
20 REM DISPLAY ALL
CHARACTERS AVAILABLE
TO BASIC.
30 FOR I = 32 TO 255
40 PRINT CHR$(I);
50 NEXT I
60 EXEC 32745   REM
INVERT SCREEN.
70 FOR I = 1 TO 500
NEXT I  REM WAIT.
80 GOTO 60
```

Two other useful machine code subroutines are given in Table 2 and 3. The subroutine given in table 2 will turn all non-graphics characters into their normal forms and the one given in table 3 will turn them into their inverse video forms. Both subroutines may be placed anywhere in memory.

Code	ASCII character	Dragon character
94	^	↑
95	_ (underscore)	←
96	` (grave)	●
123	{	[
124	|	\
125	}	]
126	~	↑
127	DEL	←

(Codes 96 to 127: inverse video)

Table 1 — differences between ASCII and Dragon character sets

```
8E,04,00,A6,84,81,7F,22,
02,8A,40,A7,80,8C,05,FF,
23,F1,39
```

Table 2 — subroutine to turn all non-graphics characters to their normal forms

```
8E,04,00,A6,84,81,7F,22,
02,84,BF,A7,80,8C,05,FF,
23,F1,39
```

Table 3 — subroutine to turn all non-graphics characters to their inverse forms

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Written in BASIC (the response time is nevertheless fast enough), this is a one player, black on green, text only game. It is well laid out, with good instructions, a good choice of options and is well error trapped.

A very good game of its type, although I would personally have preferred less companies and a two (or more) player option. A pencil and paper to keep track of shares/money is useful when playing this game.

The government action routine seems a bit vague and you are not told which areas of the market are affected, although this could be deliberate in order to increase the difficulty of the game. R.E.

instructions	92%
playability	86%
graphics	n/a
value for money	91%

★ ★ ★ ★

50 Noughts and Crosses Spectrum £6.95

Quicksilva, 13 Palmerston Road, Southampton, SO1 1LL

This game incorporates defined-depth superfast alpha beta pruning coupled with an ultra refined static position evaluator and a ruthless killer heuristic. Or so it says in the 'instructions' section of the game (loaded before the game proper)

This section is actually mainly trumpet-blowing, presumably designed to blind the player with science so that he is convinced he has a good game no matter how much he hates actually playing it

If you understand the opening sentence of this review then the game is probably for you as you presumably have a strong interest in computerised strategic games

But if you don't understand it you should just ignore it and all of the self-congratulatory preamble, because the game is actually pretty good

It is fast, has four levels of difficulty of which even Beginner is quite challenging, and plays in real time, so exerts strong pressure. It is easy to input instructions and error trapping is good

N.W.

instructions	75%
playability	85%
graphics	65%
value for money	85%

★ ★ ★ ★

Golf Dragon £8

Microdeal, 41 Truro Road, St Austell, Cornwall PL25 5JE

A machine code version of golf for one to four named players.

At the start of the game you can chose the number of holes to be played. The holes are represented graphically and come in three types — easy, tough and very tough. On the harder levels you encounter sand traps and other natural hazards. At all levels, of course, there is the rough.

For each shot on the fairway you pick your club namely wood iron or putter. For the wood and iron you must also pick the number. You must also decide which direction your shot will take, and this is based on a clock face. Once on the green you must choose both direction and distance.

You can slice the ball and get into all sorts of trouble. Once in the rough you have the options to play or lift. If you choose to lift the area around the ball becomes clear but you do lose two strokes. At the end of each hole your score for that hole the round and par for the course are displayed.

I have never played real golf and I am not an enthusiast but I thoroughly enjoyed this game. I might even become an addict yet.

J.H.

instructions	85%
playability	85%
graphics	85%
value for money	90%

★ ★ ★ ★ ★

Empire Dragon 32 £6.95

Shardl Software, 10 Park Vale Court, Vine Way, Brentwood, Essex CM14 4UR

It's you versus the evil Dragon Empire — the red menace! in a bid to rule the world. A must for budding megalomaniacs

This is a version of that very popular board game called "Risk". It is extremely colourful and uses hi-res displays showing a map of the world and close ups of the various 'continents'

A separate sheet included with the cassette explains all manoeuvres clearly giving you the option to allocate armies to territories and to attack. All outcomes are judged by the computer and an on-screen "Comment Box" keeps you informed of your progress.

There are eight levels of difficulty but I soon found that for a fairly even game you had to go to level five or six. The highest levels seem to have the odds stacked against you and, as the Empire always starts first, it's difficult to achieve any success.

This is a terrific game. I've played it several times and find it visually attractive and highly addictive. The strategies do vary as each time you select your initial territories. The neutral zones, although unable to attack, can be a help or a hindrance according to their random positioning

M.P

instructions	95%
playability	90%
graphics	90%
value for money	95%

★ ★ ★ ★ ★

Hustler Commodore 64 £5.99

Bubble Bus, The Computer Room, 87 High Street, Tonbridge Kent, TN9 1RT

Hustler is a computer version of Pool. It includes three two-player games and three one-player games. The idea is a good one and is implemented well, although it is rather limited by using only six coloured balls and a white one. These shapes look like sprites to me

You must position a white cross in line with the white ball to point your cue in a direction. Pressing the fire button or the space bar will shoot the white ball in the required direction.

There appears to be a few bugs in the program. Quite often the computer will crash when you try to hit the white ball — this can be very annoying! The only way to get out of this is to reset the computer and re run the program.

Another time a ball bounced out of the centre pocket and ran along the edge of the pool table and off the screen. There were no problems when loading the program though

The introduction to the program consists of a title page and option page. Both are accompanied by a tune which Pot Black viewers may recognise. I think the author of the program could have been a musician at one time because the tune is excellent

Overall I would say that the game could have been very good, if only it contained no gremlins

K.I.

instructions	35%
playability	70%
graphics	70%
value for money	60%

★ ★ ★

Get at those VIC-20 commands the easy way

It's tricky making the VIC perform some functions . . . unless you type in Allen Webb's programs. There's a choice of two listings, for 8K or 16K RAM expansions

One of the main failings of Commodore is their inability to extend the resident BASIC to allow ease of use of the facilities offered by the new machines

This explains the appearance of the Simon's Basic cartridge which attempts to convert the 64 into a more user friendly machine.

For VIC owners, a Super Expander fills some of the gaps in the BASIC, but at a price After nearly two years of using a VIC, I realised that it was time that I rationalised the use of some of the VIC's facilities This article is the result

One of the functions given in the routine works only on a VIC with eight or more kilobytes expansion and bearing in mind the lack of RAM in the basic machine, the routine is only available on machines with at least 8K expansion

All commands are accessed by a single SYS call (SYS 24128 (16K expansion) or SYS 15936 (8K expansion)) The command is defined by two letters followed by any parameters
For example

SYS (SA) command, parameter 1, parameter 2

The actual syntax has a little flexibility in that spaces can be included to ease reading

The parameters can be numeric values, variables or functions The one limitation is that if you use a variable for the SYS address, then brackets must be used Here are some examples of acceptable syntax

```
SYS24128PA,1,1
SYS 24128 PA,X,Y
SYS(24128) PA, RND(1)*10,
Y12
SYS(SA) PA, 0,0
```

SYS SA PA,1,1 will give a syntax error

Specifically, the commands available are

Colours

SYS (SA) BC, colour sets the border colour

SYS (SA) SC, colour sets the screen colour

Sound

SYS (SA) VO, volume sets volume

SYS (SA) TU, voice, frequency sets tone

Print at

SYS (SA) PA, X, Y sets the cursor to the specified coordinates

Line erase

SYS (SA) LE, Y erases specified line

Set height of screen

SYS (SA) RO, number of rows sets up required number of rows

Set top of memory

SYS (SA) HI, address of top of memory

For example, to set the top of memory to $5000 use SYS (SA) HI, 5*4096

Change location of screen in RAM

SYS (SA) FR, screen number (in the range 1 to 8)

The VIC with more than 8K expansion supports up to eight screens between $1000 and $2000 I discussed how this is done in an earlier article (Home Computing Weekly No 1)

This command will switch to the screen position specified in the parameter NB a parameter value out of the range 1 to 8 will result in a nasty crash Before you can access all of the screens you must raise the start of BASIC with

POKE 642,32 SYS 64824

Listings 1 and 2 give the versions for 8K and 16K **Listing 3** gives a short demo which should clarify the use of some of the commands (don't forget to raise the start of BASIC before running it!)

Listing 1 — enhanced BASIC, 16K version

```
 0 REM
 1 DATA32,121,0,201,66,208,3,76,131,94,201
 2 DATA93,208,3,76,166,94,201,68,208,3,76,206
 3 DATA94,201,76,208,3,76,254,94,201,82,208
 4 DATA3,76,23,95,201,84,208,3,76,50,95,201
 5 DATA86,208,3,76,108,95,201,70,208,3,76,142
 6 DATA95,201,72,208,3,76,220,95,96,32,115
 7 DATA0,201,67,208,25,32,115,0,32,253,206
 8 DATA32,138,205,32,247,215,198,20,173,15
 9 DATA144,41,248,5,20,141,15,144,96,76,8,207
10 DATA32,115,0,201,67,208,246,32,115,0,32
11 DATA253,206,32,138,205,32,247,215,198,20
12 DATA165,20,10,10,10,10,133,1,173,15,144
13 DATA41,15,5,1,141,15,144,96,32,115,0,201
14 DATA55,208,206,32,115,0,32,253,206,32,138
15 DATA205,32,247,215,165,28,133,1,32,121
16 DATA8,32,253,206,32,138,205,32,247,215
17 DATA165,20,133,2,166,1,164,2,24,32,240
18 DATA255,96,32,115,0,201,65,208,158,32,115
19 DATA0,32,253,206,32,138,205,32,247,215
```

```
20 DATA166,20,32,141,234,96,32,115,0,201,79
21 DATA208,133,32,115,0,32,253,206,32,138
22 DATA205,32,247,215,165,28,10,133,20,173
23 DATA3,144,41,129,5,20,141,3,144,96,32,115
24 DATA0,201,85,240,3,76,163,94,32,115,0,32
25 DATA253,206,32,138,205,32,247,215,165,20
26 DATA133,1,32,121,0,32,253,206,32,138,205
27 DATA32,247,215,165,20,133,2,166,1,165,2
28 DATA157,9,144,96,32,115,0,201,79,240,3
29 DATA76,163,94,32,115,0,32,253,206,32,138
30 DATA205,32,247,215,165,20,201,15,48,2,169
31 DATA15,141,14,144,96,32,115,0,201,82,240
32 DATA3,76,163,94,32,115,0,32,253,206,32
33 DATA138,205,32,247,215,166,20,224,8,48
34 DATA2,162,0,133,1,189,193,95,141,2,144
35 DATA189,202,95,141,5,144,169,211,95,141
36 DATA136,2,96,0,22,150,22,150,22,150,22
37 DATA150,0,192,192,208,208,224,224,240,240
38 DATA0,16,18,20,22,24,26,28,30,32,115,0
39 DATA201,73,240,3,76,163,94,32,115,0,32
40 DATA253,206,32,138,205,32,247,215,165,20
41 DATA133,55,133,51,165,21,133,56,133,52
42 DATA96
43 FOR1=24128TO24574
44 READX:POKEI,X
45 NEXT
46 POKE55,57 POKE51,57
47 POKE56,94 POKE52,94
58 REM
60 REM ENHANCED BASIC 16K VERSION A WEBB 1983
70 REM
```

Listing 2 — enhanced BASIC, 8K version

```
0 REM
1 DATA32,121,0,201,66,208,3,76,131,62,201
2 DATA83,208,3,76,166,62,201,80,208,3,76,206
3 DATA62,201,76,205,3,76,254,62,201,82,208
4 DATA3,76,23,63,201,84,208,3,76,50,63,201
5 DATA86,208,3,76,108,63,201,70,208,3,76,142
6 DATA63,201,72,208,3,76,220,63,96,32,115
7 DATA0,201,67,208,25,32,115,0,32,253,206
8 DATA32,130,205,32,247,215,190,20,173,15
9 DATA144,41,240,5,20,141,15,144,96,76,0,207
10 DATA32,115,0,201,67,208,246,32,115,0,32
11 DATA253,206,32,130,205,32,247,215,190,20
12 DATA165,20,10,10,10,10,133,1,173,15,144
13 DATA41,15,5,1,141,15,144,96,32,115,0,201
14 DATA65,208,206,32,115,0,32,253,206,32,130
15 DATA205,32,247,215,165,20,133,1,32,121
16 DATA0,32,253,206,32,130,205,32,247,215
17 DATA165,20,133,2,166,1,164,2,24,32,240
18 DATA255,96,32,115,0,201,69,208,150,32,115
19 DATA0,32,253,206,32,130,205,32,247,215
20 DATA166,20,32,141,234,96,32,115,0,201,79
21 DATA208,133,32,115,0,32,253,206,32,130
22 DATA205,32,247,215,165,20,10,133,20,173
23 DATA3,144,41,129,5,20,141,3,144,96,32,115
24 DATA0,201,65,240,3,76,163,62,32,115,0,32
25 DATA253,206,32,130,205,32,247,215,165,20
26 DATA133,1,32,121,0,32,253,206,32,130,205
27 DATA32,247,215,165,20,133,2,166,1,165,2
28 DATA157,9,144,96,32,115,0,201,79,240,3
29 DATA76,163,62,32,115,0,32,253,206,32,130
30 DATA205,32,247,215,165,20,201,15,48,2,169
31 DATA15,141,14,144,96,32,115,0,201,82,240
32 DATA3,76,163,62,32,115,0,32,253,206,32
33 DATA130,205,32,247,215,166,20,224,8,48
34 DATA2,162,8,133,1,189,193,63,141,2,144
35 DATA189,202,63,141,5,144,169,211,63,141
36 DATA136,2,96,0,22,150,22,150,22
37 DATA150,0,192,192,208,208,224,224,240,240
38 DATA0,16,18,20,22,24,26,28,30,32,115,0
39 DATA201,73,240,3,76,163,62,32,115,0,32
40 DATA253,206,32,130,205,32,247,215,165,20
41 DATA133,55,133,51,165,21,133,56,133,52
42 DATA96
43 FORI=15936TO16382
44 READX:POKEI,X
45 NEXT
46 POKE56,62:POKE52,62
47 POKE55,64:POKE51,64
50 REM
60 REM ENHANCED BASIC 8K VERSION A WEBB 1983
70 REM
```

Listing 3 — demonstration of enhanced BASIC

```
 0 REM
 10 REM
 20 REM ENHANCED BASIC DEMO
 30 REM
 40 SA=24120
 50 FORI=1TO8
 60 SYS(SA)FR,I
 70 PRINTCHR$(147)
 80 FORJ=1TO100
 90 SYS(SA)PR,RND(1)*20,RND(1)*20:PRINT"@"
 100 NEXT J
 110 NEXT I
 120 SYS(SA)VO,15
 130 FORI=1TO8
 140 SYS(SA)GC,RND(1)*15+1
 150 SYS(SA)BC,RND(1)*8+1
 160 SYS(SA)TU,1,RND(1)*50+200
 170 SYS(SA)FR,I
 180 SYS(SA)RO,RND(1)*10+10
 190 NEXT I
 200 GOTO 130
```

How the Space Shuttle launched a software shop

Regular readers will have caught our reviews of Sumlock's programs for the VIC. Here Dave Carlos finds out the story behind the software — and Sumlock's move into new programming pastures

Not many companies involved in microcomputer software can claim to owe their existence to the Space Shuttle. It did however have a part to play in the formation of Sumlock Microware.

"Sumlock was originally involved in office machinery and owned by the American giant Rockwell, but when Rockwell decided to concentrate on major products like the Shuttle contracts, Sumlock was sold to their employees on a franchise basis," said Alan Lee, Sumlock's marketing director.

"From an interest in calculating machines and programmable calculators, we went on to get a dealership for the Commodore Pet, the first affordable microcomputer. We were one of the first in Manchester, and mainly sold business packages and educational software, but eventually the hobby side of the Pet started to grow.

"This meant there was some conflict: we might have a customer trying a complete financial package in one corner whilst another played Space Invaders. It couldn't go on, so we decided to change to the home and hobby side in 1981 with the launch of the VIC 20."

Since then the company has never looked back. It still services business machines in its well-equipped workshop — which also means good service facilities for hobby customers. But now the future of the company is firmly in software production and retailing.

"We sell several VIC programs written by freelance programmers, but now have a team of in-house programmers and are looking to the formation of a separate company for our software," Alan revealed. The programmers in question are Dave Aron and Steve Course, who have been programming for the company for some 18 months now but only recently became full time staff.

Dave and Steve delayed going to University to join the company, a decision neither seems to regret. "We have so many ideas, and the new Commodore 64 is such an exciting machine, we expect to be busy for a long time", Dave said.

"We originally programmed on the VIC and with only 3.5K of RAM to play with it was always a problem deciding which features to leave out of a program. But on the 64, we can put in what we like and still have room to spare!"

"Up to now we have concentration on arcade games — that seems to be what most people want at the moment. But we will soon be writing original arcade-quality games using our own ideas. Then we will expand from the Commodore range on to other popular makes," said Steve.

From an attempt at writing a Pacman and a Frogger game in Basic the team, known on their cassettes as 'LiveWire', has come a long way. "We asked them to learn Machine Code and they never flinched," says Alan. "Within a very short space of time they had finished 'Jumpin Jack' for the VIC and the LiveWire series was started."

"One advantage of having the shop is the ability to do market research without too much difficulty. I can't resist talking to our customers and trying to find out what they want from the games. This means we can try to match the product to the customers we know.

"We do feel however that customers should have the chance to see the games before they buy, and the rise in the level of dealer sales makes this more possible."

"An aspect of this business which really worries us is the software piracy. We recently heard of a local schoolboy who was copying games by the gross and selling them through adverts on the school notice board. This is plain criminal and eventually the industry must do something about it or will be in dire straits.

"Another incident which brought this home to us was when a boy came in to buy one micro and sell another because he had over £150 worth of software for the one he wanted, all of which he got 'from his friend'!"

It is little wonder then that the company is considering the production of future releases on ROMs but "One thing is certain," said Alan, "if we got enough evidence against anyone for copying software, we would have no hesitation in taking them to court and hoping for some stiff penalties."

Returning to Sumlock's software range, Alan admitted some uncertainty about the future of the VIC. "If Commodore keeps the price of the 64 at the present level, then there may still be a future for the VIC at the bottom of the price range. We have three new releases in the pipeline for the VIC 20, adding to our current range of fourteen, but now we are concentrating on the 64," said Alan.

"We are just waiting for the artwork for our first Commodore 64 titles which will be Gridtrap and Jumpin Jack. We expect them to be much superior to anything seen before. They will have 'Halls of Fame', self play, numerous skill levels, one or two player options and include several unique program features. In fact we have tried to incorporate all the features of our present range and add to them from the customer's and reviewer's comments on our past games."

Dave said that time was the main enemy. "We have ideas overflowing but the time to program them all is hard to find. One area we do wish to branch into soon is that of speech synthesis. The Commodore 64 is ideal for this as you can set any note up any way you wish and therefore no hardware expansion is needed."

"It is time we realised that the difference between Arcade Games and micros is that you don't have to put money in them and therefore the games on a micro can be that much more complex and involving," said Steve. "We have some ideas for graphic adventures to exploit this but they will be unlike anything seen yet!"

Overall the company has a great deal of experience in the microfield and doesn't see itself falling behind in any way. "Ideas change so quickly in this business", admitted Alan. "Three months of changes in hardware can change all your plans, but one thing is certain — we expect LiveWire to electrify our future."

Alan Lee concentrating on the hobby market

Send your letter to Letters, Home Computing Weekly, 145 Charing Cross Road, London WC2H 0EE. Don't forget to name your computer — the best letter could win £5-worth of software. Queries cannot be answered on this page

Where's the software?

I have read many letters for and against the TI 99/4A on your letters page. Let me tell you my story.

I bought my TI 99/4A a few weeks ago and it cost me £149.95. Not bad, I thought, until three days later in the same shop it went down to £99.95. I put it down to bad luck and thought I must have been too hasty but my problems were only just starting.

I can find no good software except games which I like but are all mail order. Where is the software for the more serious like myself? But without any doubt the biggest problem is books. In the whole of Manchester — and that includes some very big bookshops — I found only one small paperback priced at £10. I did not bother. But the biggest problem in the shops was how to avoid being crushed by the yards high, feet deep, piles and piles of Spectrum and Dragon software books! Very annoying.

K. J. Bates
Sutton Estate, Salford

Why should we wait?

I hope that this letter gets published and that your advertisers read it and take note of the problems facing soldiers serving overseas.

I am the proud owner of a Commodore 64 and, like all of my comrades who own various types of computers, I rely on the postal services of magazine advertisements.

I have yet to receive an item of equipment within a satisfactory period of time. I.e. 14 days or even 28 days. And asking around I find that my comrades are experiencing the same problem. Although our cheques are being cashed promptly, we have to sit back and wait, and wait, and wait.

Would firms please note that we are not the minority over here. In fact, as far as ratio is concerned, 27 per cent of my soldiers and friends own some sort of computer but cannot just go to the shops and buy what we like.

Firms should also deduct VAT from overseas orders and claim it back through the relevant channels.

So come on you distributors — pull your socks up and I am sure that your sales will go up at the same time.

Staff Sergeant J. Gadd
BFPO 112

Oric problems (continued)

May I take this opportunity for thanking you for publishing my letter in HCW25. I have had a number of letters from readers, some of whom have outstanding grievances with Oric and all of whom were dissatisfied with the service they have received.

I am happy to say that Oric has also contacted me through its public relations consultants who seem keen to deal with any problems. If any other readers are having problems with Oric, I will be pleased to hear from them and pass them problems on.

Perhaps Oric will be a little more sensitive to their customers if its responses have to be made in a more public gaze. It is sad that Oric will respond to a letter in the press in less than a week while it is so slow in responding to individual enquiries.

Keith Ollett, Hookstead,
Goldsmith Ave,
Crowborough,
East Sussex TN6 1RG

Popular Puncman

Thank you for the not-so unfavourable review in HCW25, but I feel I must write and clarify a few points.

Puncman is one of our best selling programs mainly to educational establishments, and was written by a qualified teacher using principles in popular use in the teaching of punctuation in many schools.

Although some schools vary in their approach to this subject, nearly always you will find that the "incorrect punctuation" to which you refer is merely a means of simplifying punctuation to remove the clutter of symbols which a pupil finds himself facing. This gentle introduction to simple punctuation is naturally followed later by more specified tuition in the use of apostrophes, quotes etc. (This is, in fact, following in Puncman 3&4).

The insert tells the user precisely what the program is intended for and which symbols are to be concentrated upon.

The "dreadful slang" is a matter of opinion, but I would again point out that this is written by a qualified teacher in a way which in his experience, will best demonstrate the use and at the same time hold the child's attention.

May I respectfully suggest that you should co-opt members of the teaching profession when testing educational software (if you do not do so) but that if you intend making specific criticisms of the educational content rather than the material content, you should for the more serious educational programs, involve a teacher with experience relevant to the subject matter of the software.

M. F. Kerslake
Chalksoft, Worcester

Educational software in HCW is reviewed by teachers with experience of the appropriate age/study group.

Spectrum take over

I am writing to complain about the way that Spectrum advertisements, features and other articles have come close to taking over the pages of many computing magazines.

The advertisements very often take over a whole page of a magazine and this can be very annoying to other computer users such as me who has paid good money for the magazine. As a TI 99/4A user, yours is the only magazine which I regularly buy because it is the only one which has taken a serious interest in my computer although even yours has become perhaps a little too "Spectrummy".

Paul Leathley
Fallowfield, Manchester

Making money

I am writing to you concerning the VIC 20 game WACKY WAITERS. I have scored £62.23 on it. I would like to know if anyone has bettered this. On my first go I got 61p.

Anthony Vowles
Knowle, Bristol

Top Ten programs for the Spectrum

1	Tranz Am	Ultimate (–)
2	The Hobbit	Melbourne House (8)
3	Jet Pac	Ultimate (1)
4	Scrabble	Psion (2)
5	Flight Simulation	Psion (3)
6	Horace Goes Skiing	Psion/M. House (6)
7	3D Tanx	dk'tronics (–)
8	Horace and the Spiders	Psion/M House (4)
9	Ah Diddums	Imagine (9)
10	Test Match	Computer Rentals (–)

Compiled by W. H. Smith. Figures in brackets are last week's positions

Top Ten programs for the Dragon

1	The King	Microdeal (1)
2	Frogger	Microdeal (2)
3	Android Attack	Microdeal (3)
4	Nightflight	Salamander (6)
5	Shuttle	Microdeal (6)
6	Space War	Microdeal (4)
7	Morocco Grand Prix	Microdeal (–)
8	Ring of Darkness	Wintersoft (10)
9	Katerpillar Attack	Microdeal (–)
10	Planet Invasion	Microdeal (7)

Compiled by Boots Figures in brackets are last week's positions

Top Ten programs for the ZX81

1	Chess	Sinclair (8)
2	Space Raiders	Sinclair (1)
3	Espionage Island	Sinclair (2)
4	Flight Simulation	Sinclair (3)
5	Fantasy Games	Sinclair (4)
6	Football Manager	Addictive (6)
7	Defender	Quicksilva (5)
8	1K Games	Sinclair (4)
9	Asteroids	Quicksilva (–)
10	Invaders	Quicksilva (–)

Compiled by Boots Figures in brackets are last week's positions

Top Ten programs for the VIC 20

1	Arcadia	Imagine (1)
2	Skyhawk	Quicksilva (2)
3	Wacky Waiters	Imagine (4)
4	Cosmic Crunch (cart)	Commodore (3)
5	Gridrunner	Llamasoft (6)
6	Panic	Bug Byte (8)
7	Saigon II Chess (cart)	Commodore (9)
8	Cosmiads	Bug Byte (7)
9	Catcha Snatcha	Imagine (5)
10	Frantic	Imagine (10)

Compiled by Boots Figures in brackets are last week's positions

Just $25 for all this

The announcement of a rather clever program for the VIC-20 caught my eye this week I think it deserves prominent mention

It is called Research Assistant and will run on any VIC 20 having a minimum of 8K RAM, a compatible disc drive, and a printer In fact, the program will also run on the Commodore 64, although for some reason is not being advertised that way

The package consists of three programs, and comes on cassette, although it is readily transferable to disc and will support disc files and tape files interchangeably

The first of the three programs is called RA Build This is the data entry program which allows you to develop note files on tape or disc The program is menu driven

When it comes up, the first menu asks if you are going to start a new file, update or add to an existing file, change input/output devices, or quit If you choose to enter data, another menu asks if you are planning to enter a source, a reference, or add to the end of a file

Once source entry has been selected, you can then put it in whatever format you like (such as author title, comments, etc). Once entered, the information can be edited, saved as is, or erased. After a source is on file, you can enter additional references within it and the machine will automatically number these and append them.

Each reference can contain the page number and up to 1,020 characters for use as comments After the comment section, you are allowed to enter up to 12 keywords which the program will then use for indexing You can then enter two dates to act as a range for each source reference As entries are made, the program loads them onto either tape or disc as you have indicated

The second program is called RA XRef Build This is the cross reference building program This allows you to construct a cross-reference table for one or more files built by the previous program.

Within the allowances of memory, and provided you have not used the same number for several different sources, you can merge the files As you build the cross reference the program allows you to use up to 20 date ranges and associated keywords for indexing Using a VIC-20 with 8K RAM, the program will have room for about 112 "slots" (roughly 1,100 bytes) for the cross reference file Each of the slots can hold one keyword and as many as five references to it

As the files are read, and the cross references are created, the system puts the identification numbers on the screen as it works When done, the system returns to the main menu, and the screen also displays how much memory is left

The final program is called RA Print This section of the system is able to print the cross reference or the source files in any order and interchangeably from tape or disc The printout is formatted as follows the source files are printed with the bibliographic reference first followed by the comments, in turn followed by the keywords and key date ranges,

The reviewer whose evaluation I read used this program on research notes that he had accumulated over 20 years He found that the system did all it was advertised to do, and indicated that it would be virtually impossible to hand compile the sort of cross reference list that Research Assistant can do so well and so quickly.

He also felt that any experienced historian, geneologist, or journalist or other person practiced in research, would find that the note-taking system conforms to standard procedure, as taught in school or elsewhere

The system is very good at error trapping, and is extremely user-friendly It can handle odd reference systems, weird page numbering systems, or even free-form entries having no author citations Leaving certain data entries blank causes no problems

Common errors and their fixes are included at the back of the documentation, which is written in clear non-technical English

If you are doing any sort of research, this program will fill an important gap Best of all, the price is certainly right It costs all of $25 Write for details to TOTL Software, P O Box 4742, Walnut Creek CA 94596, (415) 943-7877

That's all for this week See you next time

Bud Izen **Fairfield, California**

HAVE YOU BEEN INVOLVED IN A MYSTERIOUS ADVENTURE RECENTLY?

It is quite probable that [illegible] from TIS, [illegible] known as Total Involvement Syndrome.

TIS manifests itself in a number of ways, one of the most dramatic symptoms being the victim's complete inability to [illegible] in the world of reality. Other symptoms include insomnia, a desperate [illegible] a Mysterious Adventure, and an overwhelming urge [illegible]

It is believed that TIS is usually contracted as a result of prolonged exposure to Mysterious Adventures [illegible] caused by playing any of the following Home Computers:-

[illegible] SPECTRUM, BBC MODEL B OR B+, TRS80, COLOUR GENIE, ATARI 400/800, COMMODORE 64, DRAGON [illegible] ZX81, ORIC 1.

When [illegible] about this [illegible] a representative of DIGITAL FANTASIA [illegible] who are actively involved in [illegible] Mysterious Adventures and [illegible] this is probably a cure for TIS [illegible] other than making [illegible] family, DIAM chips etc, which can be of [illegible] only a temporary nature [illegible] In the absence of a more permanent cure, I would advise TIS sufferers to [illegible] the Spectrum and obtain Mysterious Adventures from any source available to them. This is highly unlikely as [illegible] of the current Mysterious Adventure Explosion. I would say enjoy it while possible, residence is futile.

If you have a BBC Computer or a SINCLAIR SPECTRUM, you can obtain Mysterious Adventures direct from DIGITAL FANTASIA in any of the following packages:-

1) THE GREEN BATCH
2) THE TIME MACHINE
3) [illegible] WICKED PATH (PART 1)
4) [illegible]

[illegible] ARE FROM PULSAR 7
[illegible] CIRCUS
[illegible] PLAUSIBILITY EXPERIMENT

[illegible] THE WIZARD AREYZ
[illegible] PERSEUS AND ANDROMEDA
[illegible] THE LITTLE INDIANS

[illegible] Accounts are available to Partners.

[illegible] MYSTERIOUS ADVENTURES DAMAGE YOUR SENSE OF REALITY

SEND CHEQUE OR P.O. [illegible] CHECK

DIGITAL FANTASIA

Multi-coloured flashing

Want to make your Commodore 64's screen look flash? Mike Roberts tells you how to go about it

Like the look of those flashing characters you've seen on Prestel and Ceefax displays? Using my program, you can get the same flashy effect on your Commodore 64.

The program uses multi-coloured text mode. This is a more complex mode than the other three text modes because the whole character set needs to be redefined to make good use of the facilities that the mode offers.

The advantages of this mode, however, outweigh the disadvantages for certain applications. Each dot in the character matrix can be one of four colours: background, foreground, and two others defined elsewhere.

These two other colours have their definitions in two of the 6569 VIC chip's registers, and if these registers are changed then the effect is felt all over the screen, and any character using them will have its colour changed.

So if a character set, or in this case half a character set is defined using one of these special colours, its colour can be changed all over the screen by simply changing one register. For a list of the registers used and their locations, see Table 1.

That is the principle behind this program: half of the character set, the reverse field half, is defined using the special colours, one for the foreground colour and one for the background colour. The other half is as normal, except that the characters are only four dots wide — a bit confusing at first, but they are all fairly recognisable.

The method used to change the registers at regular intervals is to redirect the interrupt routine, that is, the one that updates the clock and checks the stop key etc. This is executed every 1/60ths of a second, so it is ideal for our purposes.

The instruction to turn on the flash routine is SYS 49152 and the instruction to turn it off is SYS 49165.

There are four modes of operation of the flashing controlled by poking the flash control register. This is at location 822, so POKE 822,1 gives you mode 1.

The modes are, mode 0: no flashing of foreground or background, mode 1: flashing background only, mode 2: flashing foreground only, mode 3: flashing background and foreground.

How it works

10-110 introduction
110-1400 character data
1410-1420 check data is OK
1430-1500 POKE in data for characters

The speed of flashing is controlled by the speed register at location 823, in 1/60ths of a second, so POKE 823, 60 would make a character flash once every second.

The colours that alternate for the foreground are in locations 821 and 53283, with location 53283 being the current foreground colour and 821 the next foreground colour, so POKE 821,1 and POKE 53283,0 would make the foreground flash between black and white.

The alternating colours for the background are stored in locations 820 and 53282, with 820 being the next background colour and 53282 being the current background colour, so POKE 820,2 and POKE 53282,3 would make the background alternate between red and cyan.

Unfortunately only eight colours can be used in multi-colour mode and for this application, they must have values of eight to 15.

So to get black text, use the Commodore key in conjunction with key 1. Using values less than eight for printing the characters will result in garbage on the screen instead of flashing characters.

So to print flashing text the colour POKEs must be set up as above and the system enabled. The character printing colour must be greater than eight, although only the lower eight colours are displayed, and the text must be printed in reverse field.

Of course normal procedure can be carried out for non-flashing characters, except that reverse field cannot be accessed.

To get back to normal mode use POKE 53272,21: POKE 53270,200 and to get back to flashing mode use POKE 53272,19: POKE 53270,216.

Note: Before typing in, or loading this program, the instructions

POKE 44,24: POKE 6144,0: NEW must be executed to reserve memory space for the new character set. This will destroy any program currently in memory.

```
100 REM BATH FOLLOWS FOR FLASHING CHARACTER SET
110 DATA 63  51  51  51  48  48  63  0  12  63  51  51  51  51  0  63  51
120 DATA 51  60  51  51  63  0  15  63  60  48  48  15  51  48  51  51  51
130 DATA 51  51  60  0  51  48  48  48  48  48  0  63  60  48  48  48  48
140 DATA 48  0  63  51  48  51  51  63  0  51  51  51  63  51  51  51  0
150 DATA 63  12  12  12  12  12  63  0  12  12  12  12  60  48  0  51  51
160 DATA 60  60  51  51  51  0  48  48  48  48  48  60  63  0  51  63  63
170 DATA 51  51  51  51  0  51  51  63  63  63  63  51  0  12  51  51  51
180 DATA 12  0  60  51  51  60  48  48  60  0  63  63  51  51  63  63  3  0
190 DATA 60  51  51  60  60  51  51  0  12  51  48  12  3  51  12  0  63  12
200 DATA 12  12  12  12  0  51  51  51  51  51  63  12  0  51  51  51  51  51
210 DATA 51  12  12  0  195  195  195  195  195  195  51  51  51  63  12
220 DATA 63  51  51  0  51  51  63  63  12  12  63  3  12  12  12  48
230 DATA 63  0  60  48  48  48  48  60  0  12  51  48  48  48  51  0  63  0
240 DATA 48  12  12  12  12  0  0  0  12  63  63  12  12  12  0  12
250 DATA 0  255  255  48  12  0  0  0  0  0  0  0  0  0  0  12  0  0
260 DATA 12  0  51  51  51  0  0  0  0  51  51  255  51  255  51  51  0  12
270 DATA 63  192  60  0  255  12  0  51  51  3  12  48  51  51  0  60  255  60
280 DATA 60  240  204  51  0  3  12  48  48  0  0  15  51  60  48  60  60
290 DATA 15  0  60  15  3  3  3  15  60  0  0  195  60  255  60  195  0  0
300 DATA 12  12  63  63  12  12  0  0  0  0  0  12  12  0  60  0  63  63
310 DATA 0  0  0  0  0  0  0  0  0  12  0  0  0  24  12  12  48  48  195  0  63
320 DATA 60  51  51  51  63  60  0  12  60  60  12  12  12  63  0  63  51  3
330 DATA 51  51  51  63  0  12  51  12  3  51  12  3  15  51  51  63  3
340 DATA 3  0  63  48  60  3  3  51  15  0  15  60  63  51  51  12  0  63
350 DATA 3  0  15  12  12  12  0  63  51  51  63  51  51  63  51  51  0
360 DATA 63  3  51  63  0  0  0  12  12  0  12  12  12  0  0  12  12  12  12
370 DATA 48  3  12  48  48  60  12  3  0  0  0  63  63  0  63  63  0  48  12
380 DATA 3  0  12  48  48  12  51  3  12  12  0  12  12  12  0  255  255  0
390 DATA 48  0  12  12  63  63  60  12  63  0  12  12  12  12  12  12  12
400 DATA 0  0  0  255  255  0  0  0  0  0  0  0  255  0  0  0  0  0  255  255
410 DATA 0  0  0  0  0  0  0  0  0  0  0  255  255  0  0  0  48  48  48  60  48  60
420 DATA 48  12  12  12  12  12  12  12  0  0  0  240  240  60  12  255  60  10  12  60
430 DATA 48  60  63  51  63  0  0  12  12  60  240  240  48  0  192  192  192
440 DATA 192  192  192  192  240  240  192  192  240  48  48  12  13  16  3  3  3
450 DATA 12  60  60  255  60  48  48  255  255  255  255  192  192  192  192  255
460 DATA 255  0  3  3  3  3  0  0  0  255  255  255  255  0  0  0  0  0
470 DATA 0  255  255  0  0  0  63  63  63  63  63  12  0  48  60  48  48  48  48
480 DATA 48  60  48  48  48  48  48  48  48  48  48  195  48  48  48  60  48  195
490 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
500 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
510 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
520 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
530 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
540 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
550 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
560 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
570 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
580 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
590 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
600 DATA 0  255  255  255  0  0  0  0  0  0  0  0  0  0  0  0  255  255  255  0  3
610 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
620 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
630 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
640 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
650 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
660 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
670 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
680 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
690 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
700 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
710 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
720 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
730 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
740 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
750 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
760 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
770 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
780 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
790 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
800 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
810 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
820 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
830 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
840 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
850 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
860 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
870 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
880 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
890 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
900 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
910 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
920 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
930 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
940 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
950 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
960 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
970 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
980 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
990 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
1000 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
1010 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
1020 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
1030 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
1040 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
1050 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
1060 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1070 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
1080 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
1090 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
1100 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
1110 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
1120 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
1130 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
1140 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
1150 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
1160 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
1170 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1180 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
1190 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
1200 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
1210 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
1220 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
1230 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
1240 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
1250 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
1260 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
1270 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
1280 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1290 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
1300 DATA 12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12  12
1310 DATA 48  48  48  255  48  48  48  192  192  48  48  48  192  192  48  48  48
1320 DATA 48  48  60  48  48  48  48  0  63  63  51  51  51  0  255  255  63  63
1330 DATA 15  15  15  240  240  240  240  240  240  240  240  240  240  240  240
1340 DATA 240  240  0  0  0  0  0  0  0  255  255  255  255  255  255  0  0  0  0  0
1350 DATA 0  0  0  0  0  255  192  192  192  192  192  192  192  192  192  192
1360 DATA 192  192  192  192  3  3  3  3  3  3  3  3  255  255  0  0  0  0
1370 DATA 0  0  0  255  255  0  0  0  0  0  0  0  0  0  0  240  240  240  240  240  240
1380 DATA 3  3  3  0  255  255  0  0  0  0  240  240  240  240  15  15  15  15
1390 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1400 DATA 195  0  60  255  195  195  255  60  0  12  12  51  51  12  12  63  0
1410 DATA 63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63
1420 DATA 63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63  63
1430 DATA 192  192  192  192  192  192  192  192  192  192  192  192  192  192  192  192
1440 DATA 192  192  192  192  192  192  192  192  192  192  192  192  192  192  192  192
1450 DATA 3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3
1460 DATA 3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3  3
1470 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1480 DATA 240  240  240  240  240  240  240  240  240  240  240  240  240  240  240  240
1490 DATA 15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15
1500 DATA 15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15  15
```

Table 1 — the registers

Register name	Location	What it does
Background colour 1	820	Next background colour to be used
Background colour 2	53282	Current background colour of flashing character
Foreground colour 1	821	Next foreground colour
Foreground colour 2	53283	Current foreground colour
Control register	822	Determines mode of flashing operation
Time register	823	Determines delay between flashes
VIC mode register 1	53270	Enables multi-coloured mode
VIC mode register 2	53272	Relocates character generator (and screen)

Enable flash SYS 49152
Disable flash SYS 49165

COMMODORE 64 PROGRAM

```
930 DATA 86  69  89  89  101 106 69  107 101 101 101 101 101 106 89
940 DATA 89  162 101 101 101 106 106 89  100 89  99  89  89  88  105
950 DATA 89  89  88  106 106 89  98  89  89  88  89  101 170 170 101 89
960 DATA 88  89  89  85  88  85  85  85  88  89  89  89  89  89  89  89
970 DATA 102 102 102 89  85  85  85  85  102 102 170 170 170 102 102 102
980 DATA 85  89  106 149 106 86  106 89  89  102 104 86  89  101 104
990 DATA 142 85  175 176 106 106 106 106 102 106 99  85  102 89  85  85
1000 DATA 85  85  84  89  102 101 101 101 106 99  85  102 89  89  88  102
1010 DATA 89  105 89  89  86  150 106 176 106 106 89  89  88  88  102
1020 DATA 102 89  85  89  85  85  89  89  89  89  99  89  101 85  85  104
1030 DATA 102 89  85  85  84  89  85  89  89  89  89  89  89  89  89  101
1040 DATA 101 149 85  106 106 102 106 102 102 102 106 89  85  106 85  89
1050 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1060 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1070 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1080 DATA 89  102 89  89  89  89  89  89  89  89  89  89  89  89  89  89
1090 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1100 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1110 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1120 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1130 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1140 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1150 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1160 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1170 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1180 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1190 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1200 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1210 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1220 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1230 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1240 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1250 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1260 DATA 89  89  89  89  89  89  89  89  89  89  89  89  89  89  89  89
1270 DATA 101 101 101 101 101 101 101 101 170 170 85  85  85  85  85  85
1280 DATA 170 170 101 101 101 101 101 101 101 101 101 101 101 101 149 149
1290 DATA 149 149 149 149 149 149 149 149 149 149 149 149 149 149 149 149
1300 DATA 149 149 149 149 149 149 149 149 149 149 149 149 149 149 149 149
1310 DATA 170 170 170 89  89  89  89  89  89  89  89  89  89  89  170 170
1320 DATA 89  89  89  89  89  89  89  170 170 89  89  89  89  89  169 169
1330 DATA 89  89  89  89  89  89  101 101 101 101 101 169 169 89  89  89
1340 DATA 169 185 165 165 89  89  89  89  89  89  89  165 165 165 89  89
1350 DATA 89  89  89
1360 DATA 126 162 29  142 20  3   162 192 142 21  3   96  96  162 49  142
1370 DATA 29  3   162 224 142 21  3   89  89  206 32  3   248 3   76  49  234
1380 DATA 174 35  3   142 88  3   172 84  0   188 44  0   174 52  3   172
1390 DATA 34  206 142 34  206 166 62  3   180 144 12  174 52  3   174 96
1400 DATA 208 198 27  144 142 53  3   76  49  234 96  96
1410 REMDR XXXMH 177-999THENI420
```

```
1410 OUTO1=900
1420 RESTORE:L=2040 :FKO=174697THENPRINT"ERROR IN DATA" STOP
1430 READR IFR=-999THENI530
1440 PINKEL K:L=L+1 :OUTO1=K
1450 POKEOUTO1,127 POKE1,P PEEK=@TO2047 POKE4096+1 PEEK(53248+1)
1494 POKE1,35 POKE53233,125
1470 L=40152
1480 READR IFR=-999THENI800
1490 PUKEL K:L=L+1 :OUTO1=K
1500 POKEOUTO1,19 :POKE53270,216
1510 PRINT=OUTO2048 READR IFPEEK(2048+1)>0THENPRINT1 STOP
4010 NEXT
READR
```

Listing 1 — the machine-code program

```
5000 IRQVEC = 59014
5010 IRQ = 59991
5020 BORDER = 49234
5030 MULCOL1 = 61053
5040 MULCOL2 = 61063
5050 FRMCOL = 8WKCOL:1
5060 FLASHCTL = FRMCOL+1
5070 FLASHTIM = FLASHCTL+1
5075 FLCOUNT = FLASHTIM+1
5080 B = 9C000
5090 B1
5100 LDA #<FLIRQ
5110 STX IRQVEC
5130 LDX #>FLIRQ
5120 STX IRQVEC+1
5140 CLI
5150 RTS
5160 LDA #COW
5170 STX IRQVEC
5180 LDX #>IRQ
5190 STX IRQVEC+1
5200 CLI
```

```
5210 RTS
5220 FLIRQ DEC FLCOUNT
5230 BEQ DOIT
5240 JMP IRQ
5250 DOIT LDX FLASHTIM
5260 STX FLCOUNT
5270 LDX FLASHCTL
5280 BNE B
5290 DEC FLASHTIM
5300 LDX BWKCOL
5310 LDX MULCOL1
5320 STX BWKCOL
5330 FLASHTIM 304 8
5350 BCC EXOIT
5360 LDX FRMCOL
5370 LDX MULCOL2
5380 STX MULCOL2
5390 STX FRMCOL
5400 EXIT JMP IRQ
READR
```

Listing 2 — assembler listing showing how the machine code works. Do not type in

sinclair special

4

Inside...
Two special offers...
Six new software titles...
Microdrive!

Something for everyone, from Sinclair!

Welcome to another Sinclair Special. Even if you're not yet a Sinclair owner, I believe you'll find something of interest in this latest issue.

For instance, if you're looking for the best way to begin computing, turn to our back page. You'll see that leading Sinclair retailers are now offering the popular ZX81, complete with a 16K RAM Pack and a free software cassette, all for £45. That means savings of at least £29 on one of the world's all-time best-selling computers.

Those same retailers are also offering the ZX Printer at its regular price of £39.95, but accompanied by a free 5-roll Paper Pack, worth £11.95.

If you want to add even more speed and versatility to your ZX Spectrum system, you'll be pleased to hear that the new ZX Microdrive has now been officially announced.

Microdrives are being released on an order of priority basis. Spectrum owners who purchased direct from us will be sent order forms, in a series of mailings that begin with the earliest names on our list of Spectrum owners. If you didn't buy direct from us by mail order, send us your name and address (use the coupon in this Sinclair Special). We'll add your name to the list, and send you a colour brochure and details on how to order.

Finally, if you're looking for more ways to use your ZX system, take a look at the software opposite. There are programs for programmers, a space-chase and car race for arcade-game players, a brand new logic game for those who've exhausted 'the cube'.

The Cattell IQ Test is based on the definitive professional psychologists' test – and forms an accurate but easy way of measuring your own IQ. All the new programs are available direct from us, through the order form in this issue.

You'll see what I mean about Sinclair having something for everyone. And we'll have even more to show you at two forthcoming exhibitions: the PCW Show at the Barbican Centre, from September 28th to October 2nd, and the Great Home Entertainment Spectacular at Olympia, from September 17th to 25th.

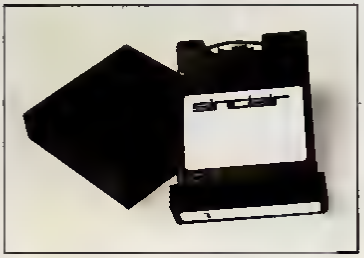
Nigel Searle

Nigel Searle, Managing Director
Sinclair Research Ltd

ZX Microdrive System preview!

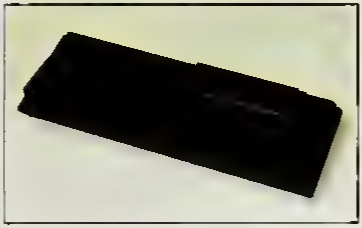
ZX MICRODRIVE

At least 85K bytes storage, loads a typical 48K program in as little as 9 seconds. £49.95



ZX MICRODRIVE CARTRIDGE

Compact, erasable, revolutionary. Complete with its own storage sleeve. Contains up to 50 files, with a typical access time of 3.5 seconds. £4.95



ZX INTERFACE 1

Necessary for sending and receiving information from ZX Microdrive. Includes RS232 interface and local area network facility for 2 to 64 Spectrums. Attaches to the underside of your Spectrum. Purchased with ZX Microdrive, just £29.95. As separate item, £49.95.

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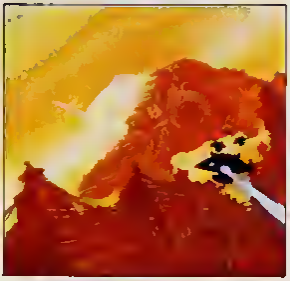
Sinclair have it all taped with six brand-new programs for ZX Computers!

Chequered Flag
For 48K RAM Spectrum **£6.95**

Have you ever wanted to drive a Formula One car flat-out round a Grand Prix circuit? With Chequered Flag you'll need one eye on the road and one eye on the instruments, as you steer and brake to avoid hazards, and work through the gears in search of the lap or race record. This outstanding new program puts you in the driver's seat with stunning realism, and gives you a choice of three cars and ten different circuits. Don't crash!



Mothership
For ZX81 with 16K RAM **£4.95**

Scream down the claustrophobic confines of the Zarway. Engage suicidal drone fighters in deadly laser combat. Dodge, duck and dive in a high-speed 3-D race to attack the evil Mothership before she claims your home planet. Mothership is a truly tough challenge, and fast, furious fun!

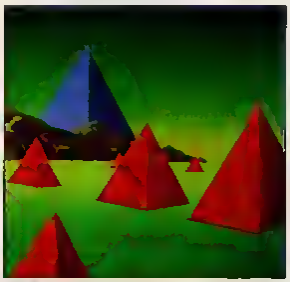
Cattell IQ Test
For 48K RAM Spectrum **£12.95**

Although there are a number of so-called self-administered IQ tests on the market, the only reliable way of finding your IQ has – until now – been to visit a qualified psychologist and take a battery of tests – for a fee. Now Victor Serebriakoff, International President of Mensa, has produced Professor Cattell's test in a form which enables you to use your ZX Spectrum to test your IQ.

The Cattell Scale IIIA test is timed by the computer, marked immediately, and the marks standardised against your age. This is the first time that an accredited, standardised test has been available to the general public.

Zeus Assembler
For 48K RAM Spectrum **£12.95**

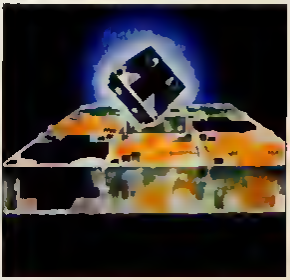
A powerful and easy-to-use programming aid, designed to simplify the entire process of producing machine code programs, enabling you to write in assembly language instructions. Comes complete with comprehensive range of support facilities.



Monitor and Disassembler
For 16K & 48K RAM Spectrums **£12.95**

This powerful Disassembler translates machine code into comprehensible assembly language instructions, allowing you to examine the BASIC ROM, to investigate the workings of the Spectrum or to analyse your own machine code routines.

With the highly versatile Monitor, you get an extensive set of facilities to aid the entry, inspection, modification and debugging of your own machine code programs.



Flippit
For 16K or 48K RAM Spectrums **£9.95**

Like those cube games, Flippit looks simple. But its fiendish ingenuity results in the ultimate game of logic and patience. Twist, turn and swap the nine Flippit pieces in search of the elusive magic square. But be warned, those pieces can be arranged in *millions* of combinations.

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	ZX Spectrum – 16K	3002	99 95	
	Postage and packing	0029	4 95	
			TOTAL £	

ZX81 Starter Pack and Printer and Paper offers are not available by mail order

Section B software purchase

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	L3/S Zeus Assembler	4402	12 95	
	G26/S Flipit	4025	9 95	
	P1/S Cattell IQ Test	4500	12 95	
	G31/S Chequered Flag	4030	8 95	
	FOR ZX81			
	G26 Mothership	2125	4 95	
			TOTAL £	

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Get your micro working

Though it won't actually make the tea, there are lots of useful jobs your computer can do for you — with the right software

SYSTEM — 4A TI 99/4A (Extended BASIC, disk cantroller, dick drive) £50

Priory Computing, 14 Bridgewood, Brookside, Telford, Shrops

This suite of three spreadsheet-type programs could be a useful alternative to the PRK module for rich Texas owners

It lets you create a form, called a 'screen', with full control of layout — and without some of the daft restrictions of the PRK You must design everything on paper first, though

More than one field per screen line can be specified, and up to 20 fields over 23 screen lines are permitted, up to a total character count for the field contents of 256

There are a number of useful screen-editing facilities, and on the whole I found the creation program easy to use

As with the PRK, you can specify the type of data accep table for each field, but I found one fault the first field is used as the form number and must have a particular data type and a minimum number of characters

It is easy to overlook this, and it can cause problems later You can come unstuck over character counts in a similar way

The documentation is very good I could fault it in only one respect not once does it tell you that you need Extended BASIC

instructions	99%
ease of use	90%
display	100%
value for money	75%

★ ★ ★ ★

Statistics BBC B £6

Rainbow Research, 288 High Street, Enfield EN3 4HF

The statistics program package from Rainbow offers five procedures with up to 100 values in each The procedures available are mean and standard deviations, T tests, chi square tests, contingency tables, and regression and least square fit

The program is menu-driven On choosing your option, you input the data as prompted and after the last value the S key terminates the data input stage and any further mathematic work is computed and displayed

At this point the program drops out and to run any other option you have to type in RUN Surely it wouldn't take too much programming effort to return to the menu?

The instructions supplied are adequate if you understand statistics, but the less bright among us like me, will find them difficult to follow

The program uses no graphics at all and would appear to turn the powerful BBC B into a calculator Graphics could be a useful addition to anyone writing such a package

J H

instructions	45%
ease of use	80%
display	0%
value for money	15%

★

Letterwriter Sharp MZ-80K £8

Epsom, 25 Chartwell Place, off Downs Road, Epsom, Surrey

OK, so what will it do? Well as well as allowing you to prepare and enter the text of your letters, you can send the whole thing to your printer for any number of copies to be printed

You can delete, add or amend any or all of the lines of text, as required, before sending to the printer Your letter may be saved on cassette for later recall

You can also save a mailing list on cassette so that individually addressed copies of the same letter can be printed

Finally, up to five standard paragraphs can be set up, stored in memory and called upon at any time for adding to the main body of text as necessary

All of this is achieved via an eight option menu and three graphics pad keys

A true word processor package will cost hundreds of pounds so for £8 you can expect some limitations Some of these are no more than 200 lines, each of 60 characters is allowed, there is no count or indication of line length, and standard paragraphs cannot be SAVEd for future use

I had a few problems due to my non standard Centronics printer/interface but a small amount of patching soon remedied the situation

More worrying was the syntax error reported on line 4360 The program stopped on every run until 4360 was deleted

I H

instructions	80%
ease of use	65%
display	70%
value for money	70%

★ ★ ★ ★

Easyplot BBC B £15.95

Synergy Software, Dept 1, 7 St Andrews Close, Slipend, Luton

This package is three separate menu driven programs, one for drawing line graphs, one for bar charts and one for pie diagrams

Up to three line or bar charts, or four pie diagrams may be stored within each program and line or bar charts may be merged All diagrams can be saved on tape/disc or printed

It is a sophisticated package which includes an excellent automatic scaling, sorting and labelling facility which removes most of the difficult work in graph design Users can opt for manual design but I found the automatic option more than adequate for most purposes

A powerful overwrite facility enables the user to print text anywhere on the screen and there is a wide choice of plot shapes and bar shading options available

I found it extremely easy to set up well designed diagrams and the quality of the programming and prompts were such that the manual was almost superfluous

The only real fault I could find was that printed symbols on pie diagrams were not always accurately positioned Screen displays for the line and bar charts are black and white, which could be a drawback when coloured printers become widely used

Easyplot's main use will be as a business utility

J D

instructions	70%
ease of use	95%
display	75%
value for money	75%

★ ★ ★ ★

Database 48K Oric-1 £4.95

Database Systems, 82 Towers Rd, Poynton, Cheshire

A utility filing program for the Oric I costing less than £5? Can it be true? So it was with some enthusiasm I tried to load the program into my Oric

Half an hour later I was still trying, and my enthusiasm was much diminished A further 15 minutes went by before my Oric received an error free program

No instructions were provided with the program so, if the word 'field' means little more to you than acres of grass, you may have problems

However once in use, the program proved to be a quite powerful computer filing system All the usual features are there, enter, delete, sort list, search, save file, and load file The sort option operates on any field, and is very fast

The program is 'menu-driven', and the on-screen instructions make it easy to use You can select the number and names of fields your require

The screen layout is unimaginative, and I thought the use of sound (e g SHOOT and EXPLODE) was misplaced in a 'serious' application program

However, if you have the patience to load the program, you could make a back-up copy, and have a simple but effective and flexible database system for your Oric

D N

instructions	60%
ease of use	70%
display	40%
value for money	70%

★ ★ ★ ★

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BOOKS

In Issue 28 (13.9.83) Rosetta software appeared under books. Please see this week's software games section which is more applicable.

MICRO TAN 65 OWNERS

The Micro Tan 65 is back. If you want to be kept up to date with the latest news — reviews — hardware and software products, then you should subscribe to

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HARDWARE

TI99/4A
Single cassette lead £4.95. Dual cassette lead £4.95. Cassette recorder (at work? guarantee reel) including tape counter, record lamp, but mains operation, incl £22.48. Recorder + single lead, £26.95 all prices inc. SAE full list (see also software games classification). Cheques/POs Christine Computing, 6 Florence Close, Watford Herts.

BUY OR SELL HARDWARE THROUGH H.C.W. H.WARE SECTION. IF YOU'VE ALREADY BOUGHT WHY NOT ADD-ON? MAKE SURE YOU APPEAR IN THE RIGHT SECTION. RING 01-437 1002 EXT 213.

FOR HIRE

To Hire a Computer from ZX81 upwards, ring or write to Business and Computer Services, 292 Caledonian Rd., N1 1AB. Tel 01-607 0157.

Oric Software Library. Two weeks hire £1. Annual Membership £5. Stamp for list. Les Wilson, Penalhick, Tintagel, Cornwall.

FOR SALE

VIC1515 Printer, Visawriter and paper £180. Arfon expansion unit with switched sockets and cover. Tel 0258 55420 after 5 pm.

Sharp MZ-80A, Knockout Whist with instructions for beginners, and Launcher £4.99. Scotsoft, 16 Grange Road, Edinburgh, EH9 1UJ.

TI99/4A plus two cartridges soccer and invaders, also £75 software. Cost £275. Sell £160 O.N.O. Phone 06706 36250.

TI99/4A with 5 cartridge games, extended basic cartridge and cassette leads. 2 sets of joysticks, speech synthesis and teach yourself basic cassette programs and tape games. Cost £550. Accept £350. Tel 061 945 2531.

ZX81 32K, typewriter keyboard, book, magazines, 3 programs plus b/w portable television. V.G.C. £90. Tel. Bourne End 22305 06285.

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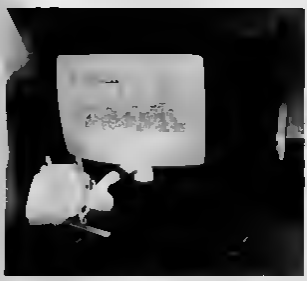

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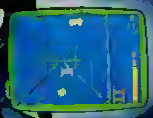

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